Comparative Tests of Induction Wattmeters

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C. S. Henning, Jr.

1907

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Comparative tests of
induction wattmeters

COMPARATIVE TESTS

OF

INDUCTION WATTMETERS

A THESIS

PRESENTED BY

ELMER J. SIGWALT
AND
CHARLES S. HENNING, JR.

TO THE

PRESIDENT AND FACULTY

OF

ARMOUR INSTITUTE OF TECHNOLOGY

FOR THE DEGREE OF

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

HAVING COMPLETED THE PRESCRIBED COURSE OF STUDY IN

ELECTRICAL ENGINEERING

JUNE 1ST 1907

John E. Snow
Acting Director Elect. Eng. Dept.

Howard M. Raymond
Dean of Eng. Studies

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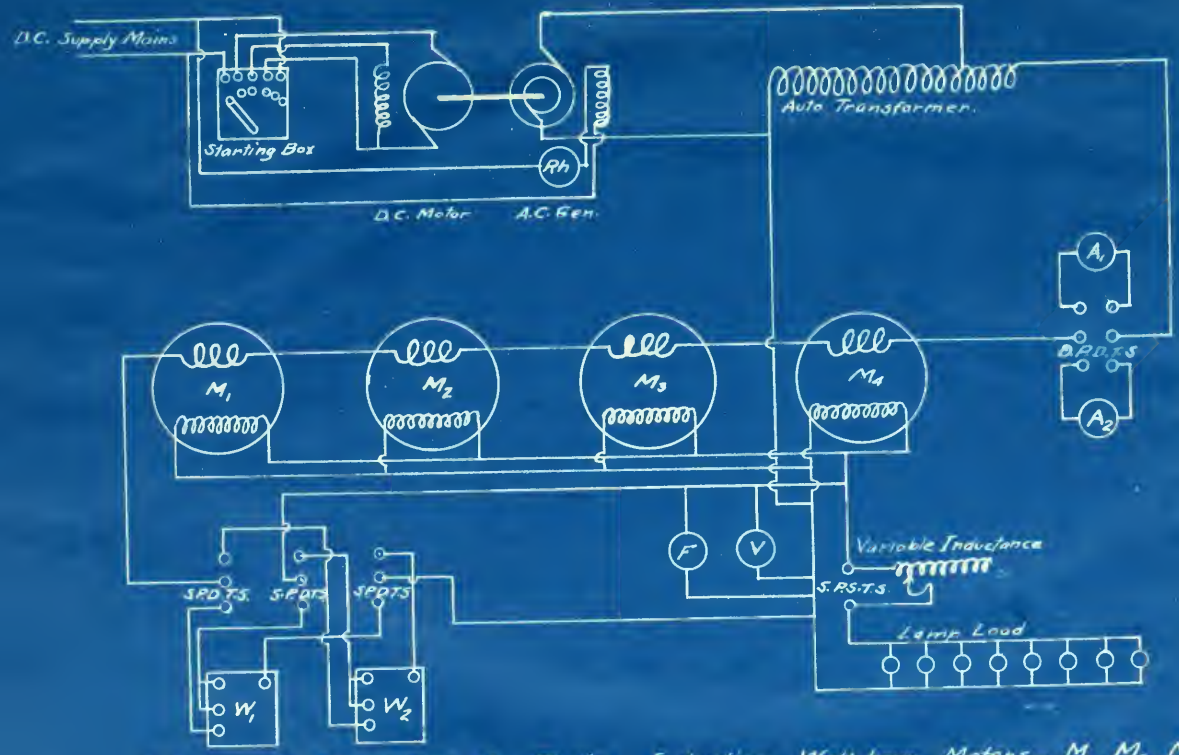

Scheme of Connections for Testing Induction Watt-hour Meters— M_1, M_2, M_3, M_4.
F-Frequency meter. V-Voltmeter. A_1, A_2-Ammeters. W_1, W_2-Indicating Wattmeters.

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COMPARATIVE TESTS OF INDUCTION WATTMETERS.

The object of this thesis was to obtain a set of data showing the effect on various commercial induction wattmeters of variation in electromotive force, temperature, frequency, and power factor at various loads.

This data was obtained on five well known types, namely Fort Wayne, Types K and W, Duncan Type A, Westinghouse Type C and Schaeffer Type E.

The apparatus and method are best shown by the accompanying blue-print. A 5 H.P. Lincoln, variable-speed motor was used to drive a 5 KW. single phase Wood alternator. As the voltage obtained was only 90 volts on no load, it had to be stepped up. For this purpose a 5 KW. G.E. transformer was used, using the four secondary coils as an auto-transformer. Two Thomson ammeters, (0 - 5) and (0 - 25) amperes, were used to measure the current; two Weston indicating wattmeters, (0 - 5) and (0 - 25) amperes capacity, were used to measure the true watts; and a Weston voltmeter was used to measure the voltage. All the instruments were calibrated weekly. The wattmeters and voltmeter were calibrated with standard instruments in the laboratory. A Pohl-commutator was used to reverse the current, the average reading being taken as the true value. The ammeters were calibrated by means of an electro-dynamometer. The

19496

dynamometer was first calibrated with the standard instruments as above. Calibration curves were then plotted for each instrument and the true readings could then be found knowing the actual readings.

A Hartmann-Braun frequency meter of the vibrating reed type was used. The inductane was a special piece of apparatus designed by Professor Thordarson, having a movable, laminated, iron core, the position of which could be varied by means of a hand wheel on the side, thus changing the inductance of the coil. The large box, shown to the right, was used to bring the meters up to the required temperature, The box is abestos-lined so it held the heat after the temperature had been reached. Four car heaters of the Iron in Enamel type were used to obtain the required temperature. The meters were mounted as shown, being placed in the center of the box and then leveled and securely fastened. In order to reduce the vibrations of the case, the table supporting the same was mounted on rubber pieces.

The load was supplied by means of a lamp rack so arranged that any desired load could be obtained by various combinations of switches and a small rheostat in series with a single lamp.

The electrical scheme of connections is also shown in the blue print. As seen, the current coils of the four induction wattmeters are all connected in series while all four pressure coils together with the voltmeter are

connected in at the same places so that the voltage is the same across each coil. The excitation for the generator was obtained from the same supply mains as the motor current. The feild current was regulated by two field rheostats in series with the field coils. In order to decrease the time needed to change from one set of instruments to another three single-pole, double-throw switches and on double-pole, double-throw switch were used. By simply throwing over all these switches the act was accomplished, thus reducing the time lost to a minimum.

First a set of data was obtained under general conditions, namely:- 110 volts, 60 cycles, approximately 60° F. and approximately unity power factor. The number of revolutions were counted for five minutes, using a stop watch and a counter. Nine values of current were used varying from 50% overload to 10% load. Then the voltage was changed to 80, 100 and 120 volts in order and a set of data taken for each voltage, all other conditions remaining the same as in the general conditions. Next the frequency alone was changed in the general conditions, frequencies of 40 and 50 cycles per second being used. A set of data was obtained for each frequency as in the general case. Then the power factor alone was changed by placing the inductance in series with the load. By varying the position of the core, power factors of approximately 50% and 75% were obtained for each value as above. Lastly the temperature alone was changed, temperatures of

approximately 50°, 100°, and 150° were used. This gave three more sets of data. Thus the grand total was brought up to 11 runs for each meter.

Each meter was tested for quadrature in the following manner. The generator was used as a two-phase alternator. The pressure coil was connected directly across one phase while the current coil was connected in the other phase. A lamp rack was used to load up the current coil. In order to bring the current of the current coil in quadrature with the electromotive force of the pressure coil a condenser had to be connected in parallel with the lamp rack. As a 5 ampere Weston Indicating wattmeter was used to obtain the true watts a series transformer had to be used because the loadin the current coil was 10 amperes. An ammter was placed in the currebt circuit while a voltmeter was placed across the pressure circuit. The current was regulated by means of the lamps and the condensers so the the meter came to a standstill although the ammeter read approximately 10 amperes and the voltmeter 110 volts. Now knowing E and I_A and the true watts the angle can easily be found from the formula E I cos θ = true watts.

Lastly the shunt loss was measured using a wattmeter while the series loss was calculated, knowing the ohmic resistance of the series coils, their resistances being found by the voltmeter-ammeter method.

Discussion:-

The tendency for an induction wattmeter is to run slow on both light and heavy loads. This fact is shown by the first eleven curves for each meter. No adjustments were made to the meter as we wished to determine the effect on the meter of any variation in load, voltage, etc., rather than to obtain a calibration curve of the meter.

All of the meters were rated at 100 volts but were tested under conditions at 110 volts. An induction wattmeter will run fast on low voltages and slow on high voltages((see curves 12 - 17 inclusive under each meter).

The effect on the meters of any variation in frequency is different in the case of each meter (see curves 18-23 inclusive under each meter). The meters are all rated at 60 cycles per second and were also tested at 40 and 80 cycles per second.

The Schaeffer runs slow on low frequencies and fast on high frequencies.

The Fort Wayne Type K runs slow on low frequencies but is practically correct at frequencies of 60 and 80 cycles per second.

The Westinghouse meter runs slow on both low and high frequencies.

The Duncan meter runs fast with a low frequency and slow with a high frequency.

The Fort Wayne Type W runs slow on low frequencies but is practically correct at frequencies of 60 and 80 cycles per second.

The effect of change of power factor is the same for all meters. They tend to run fast with a low power factor. This tendency is greater in some than in others but the variation in any meter is not greater than 2% which is the condition of commercial accuracy (see curves 24 to 29 inclusive under each meter).

The effects of temperature are peculiar. The meter will run about as fast at 120° F. as it does at 60° F. but will run slower at 80° F. and 100° F.

The reason for the good results of the power factor tests is shown in the quadrature tests. The accuracy with which the magnetic fluxes have been brought approximately into quadrature is suprising.

The different meters were tested for starting current. This was found to be very small, being less than .05 ampere in all cases. No definite results were obtained owing to the different values obtained for different positions of the rotating element.

CALIBRATION
OF
MEASURING INSTRUMENTS.

Calibration of Weston Voltmeter #753.

April 2, 1907.

True Volts	Voltmeter reading
80	78.6
90	89.05
100	98.6
105	104.0
110	109.05
115	114.1
119	118.05

April 15, 1907.

True volts	Voltmeter reading
80	78.6
90	88.95
100	99.1
105	104.2
110	109.25
115	114.25
120	119.2

April 22, 1907.

True volts	Voltmeter reading
80	77.65
100	96.90
110	105.75
118	115.35

April 29, 1907.

True volts	Voltmeter reading
80	77.15
90	86.9
100	97.85
110	108.25
115	113.85
118	117.4

ENGINEERS
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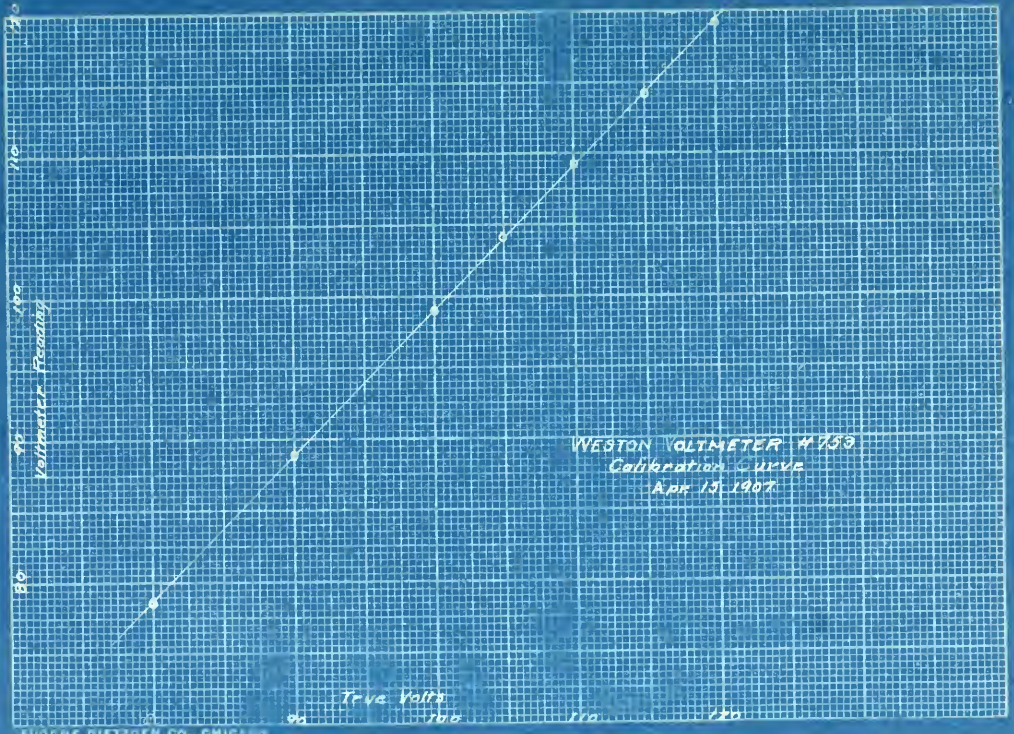


EUGENE DIETZGEN CO., CHICAGO

EUGENE DIETZGEN CO. CHICAGO
INVERSION TEMPERATURE
JOULE-THOMSON EFFECT
Pressure in Atmospheres
Temperature in °K

EUGENE DIETZGEN CO. CHICAGO
Water Temperature Fahrenheit
Water Temperature Centigrade
Specific Gravity
Weight per Cubic Foot
Weight per Gallon
Specific Volume
Cubic Feet per Pound
Gallons per Pound
Pounds per Cubic Foot
Pounds per Gallon
WEIGHT OF WATER
AT DIFFERENT TEMPERATURES

Calibration of Queen & Co. Electro-dynamometer # 111.

High Current Coil

April 2, 1907.

True amperes	Dynamometer reading
2	2.75
4	12.5
6	29.0
8	51.85
10	80.95
12	115.5
14	156.5
15	179.0

April 29, 1907.

True amperes	Dynamometer reading
5.0	20
7.5	46
10.0	81.25
12.5	125.5
15.0	179.5
4.0	14.5

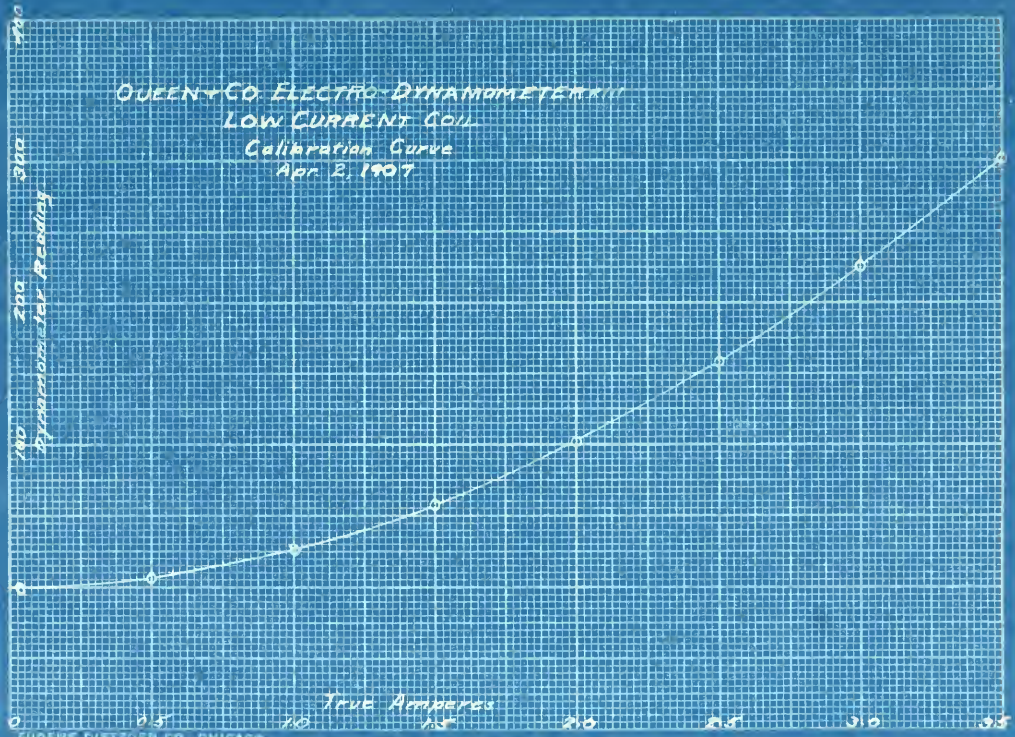
Low Current Coil

April 2, 1907.

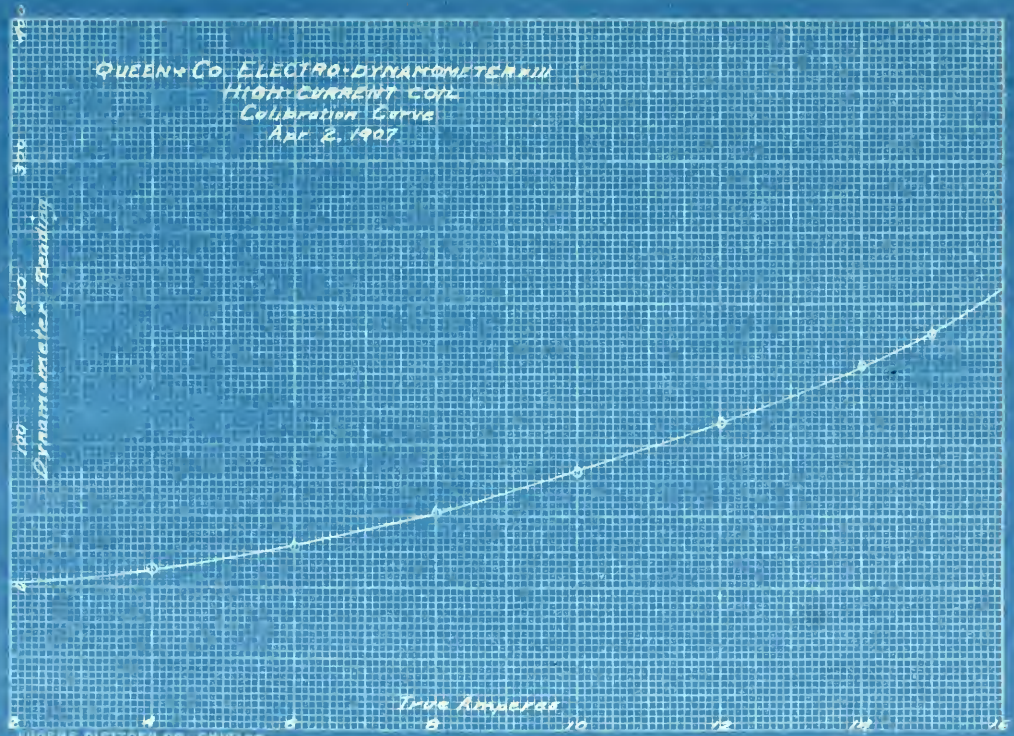
True amperes	Dynamometer reading
0.5	6.25
1.0	25.25
1.5	57.25
2.0	101.5
2.5	158.25
3.0	225.7
3.5	309.25

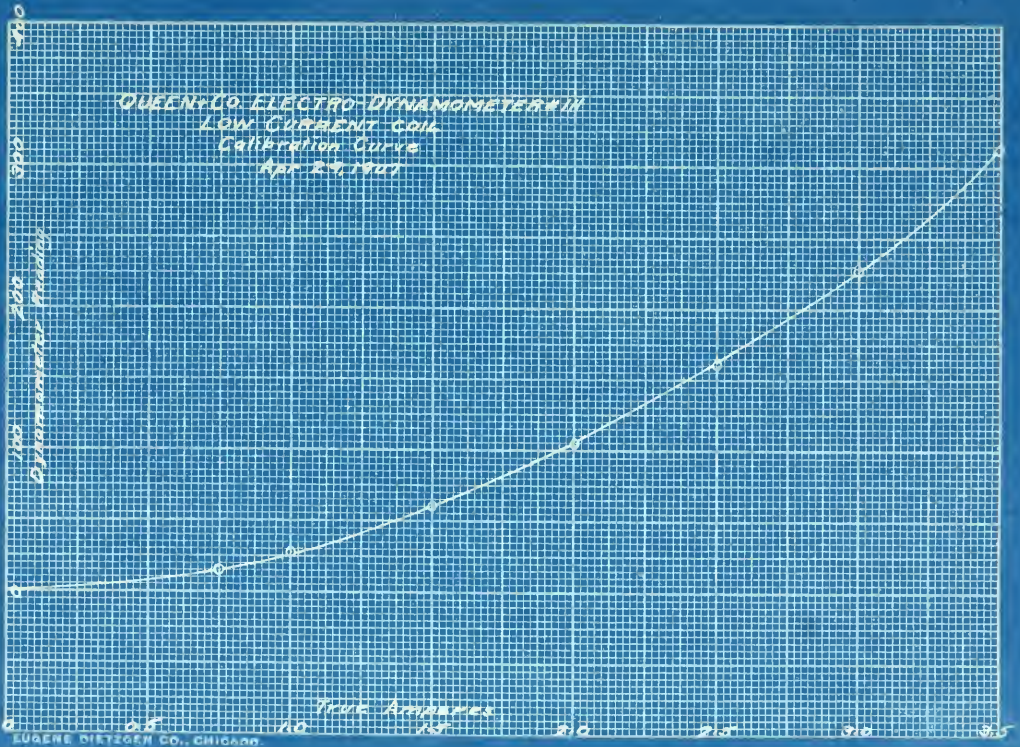
April 29, 1907.

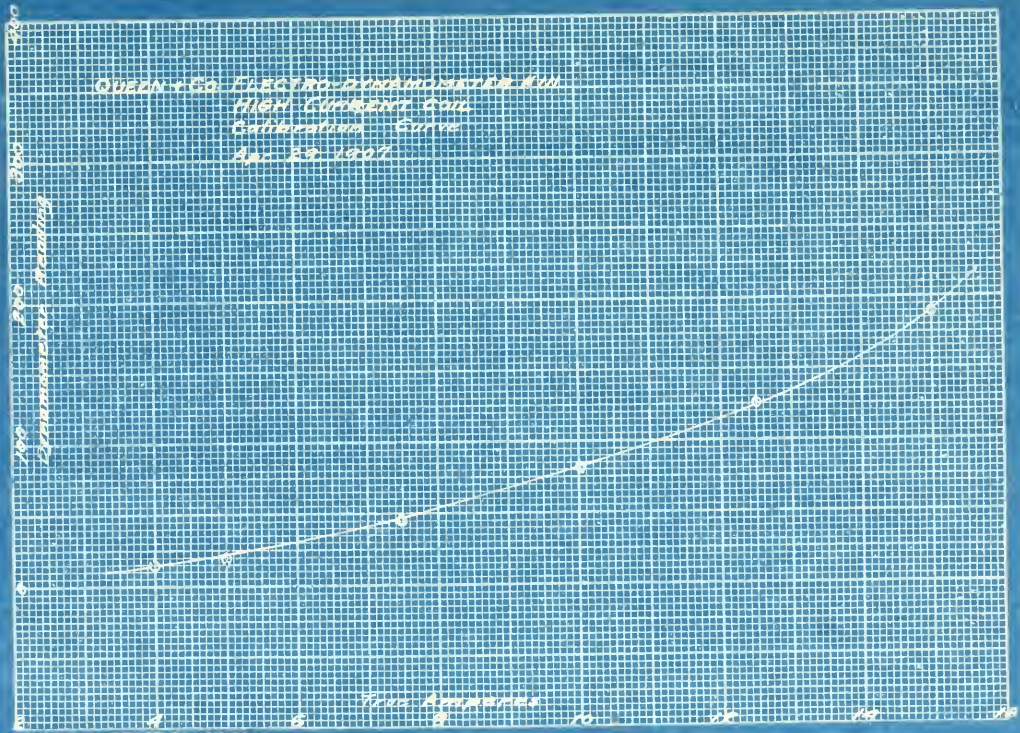
True amperes	Dynamometer reading
.75	16.5
1.0	28.0
1.5	60.0
2.0	105.0
2.5	161.0
3.0	228.5
3.5	312.5
3.75	360.0



EUGENE DIETZGEN CO., CHICAGO.


QUEEN & CO. ELECTRO-DYNAMOMETER
HIGH CURRENT COIL
Calibration Curve
Apr 2. 1907
Dynamometer Reading
True Amperes
EUGENE DIETZGEN CO., CHICAGO.


QUEEN & CO. ELECTRO-DYNAMOMETER No. III
LOW CURRENT COIL
Calibration Curve
Apr. 28, 1897
Torque in Centimeter Grams
Plate Amperes
0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
EUGENE DIETZGEN CO., CHICAGO

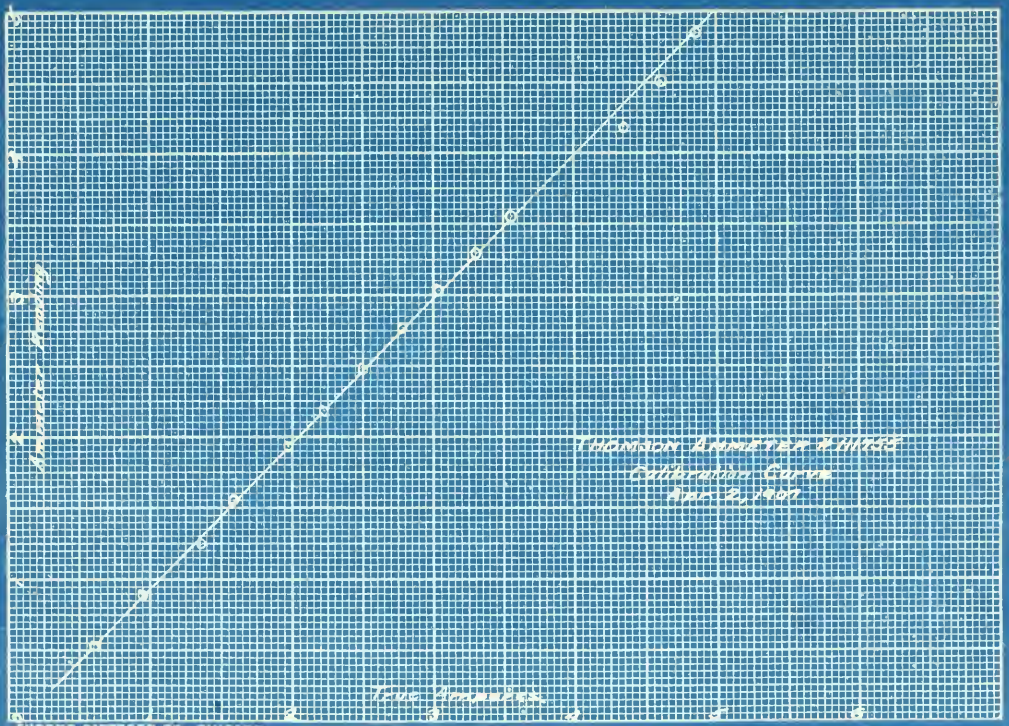


EUGENE DIETZGEN CO., CHICAGO.

Calibration of Thomson Ammeter " 111755.

April 2, 1907.

Dynamometer reading	True amperes	Ammeter reading
10.0	.61	.54
22.0	.95	.89
47.0	1.36	1.25
63.0	1.58	1.55
97.0	1.97	1.93
125.0	2.22	2.18
156.0	2.5	2.47
194.0	2.78	2.76
232.0	3.03	3.03
276.0	3.3	3.3
319.0	3.55	3.54
15.0	4.35	4.18
17.2	4.61	4.51
19.1	4.84	4.85



EUGENE DIETZGEN CO., CHICAGO.

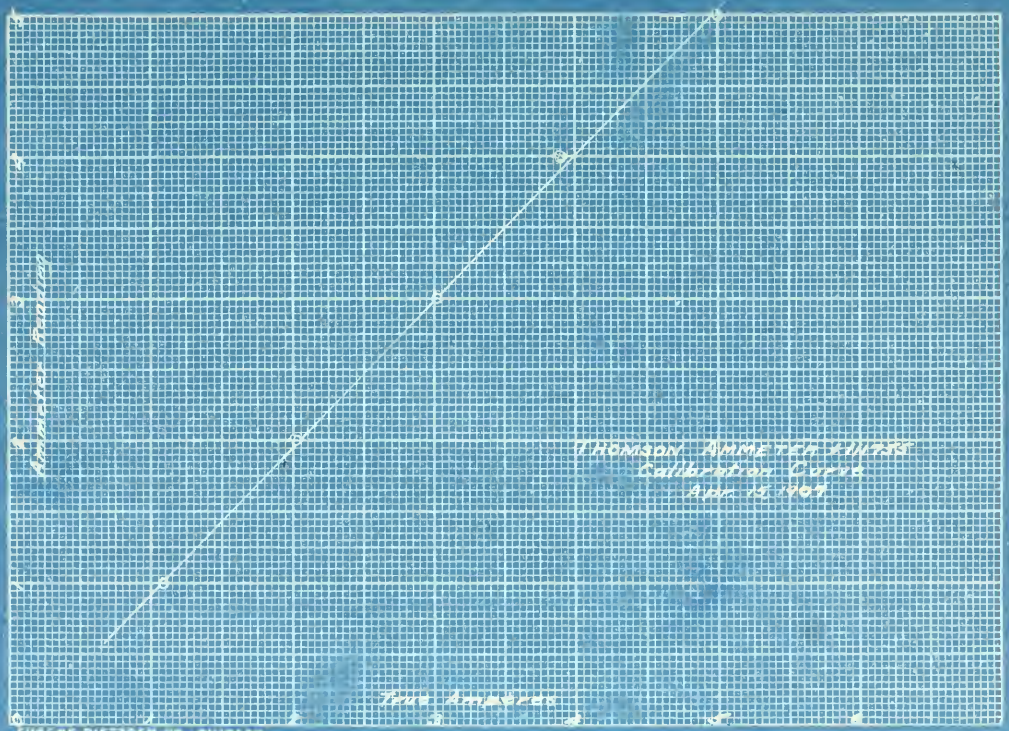
Calibration of Thomson Ammeter # 111755.

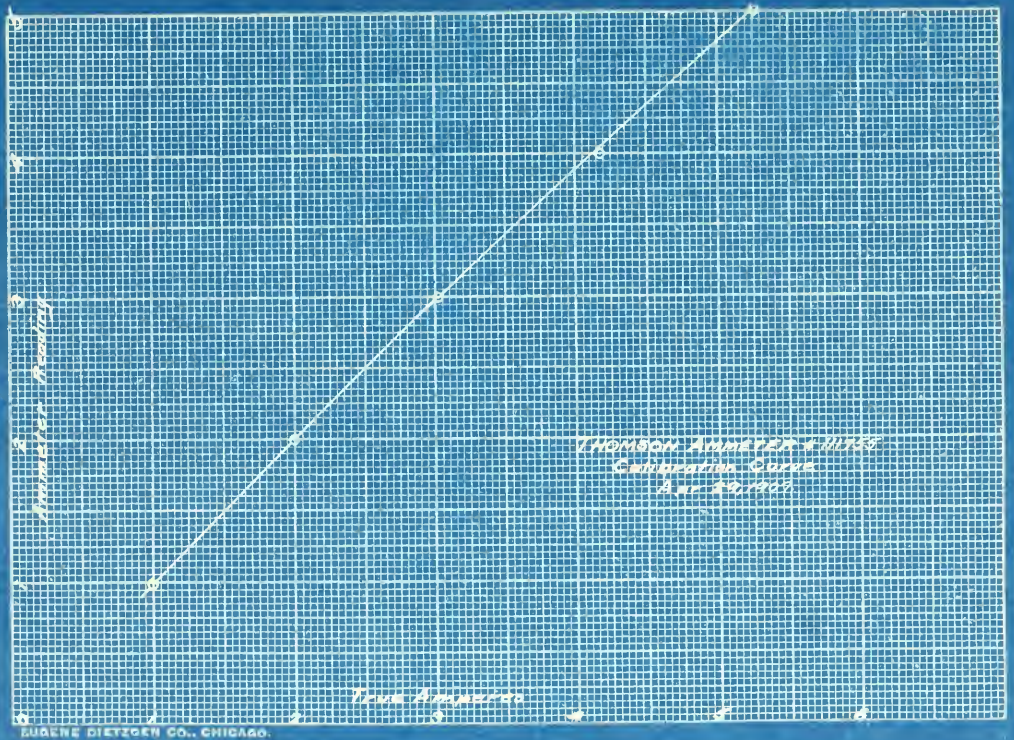
April 15, 1907.

Dynamometer reading	True amperes	Ammeter reading
27.0	1.08	1
103.0	2.02	2
227.0	3.01	3
11.5	3.90	4
20.0	5.00	5

April 29, 1907.

Dynamometer reading	True amperes	Ammeter reading
27.0	0.98	1
105.0	2.00	2
230.0	3.02	3
15.0	4.18	4
22.0	5.25	5


THOMSON ARMATEST SWITCH
EUGENE DIETZGEN CO., CHICAGO.

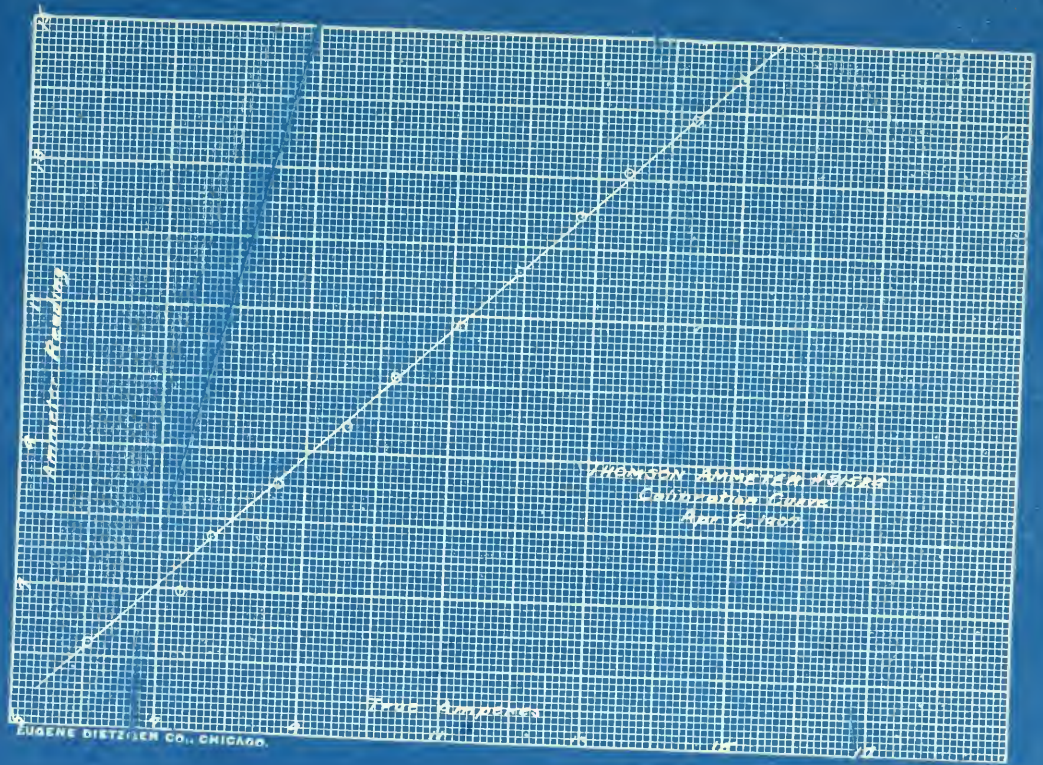


EUGENE DIETZGEN CO., CHICAGO.

Calibration of Thomson Ammeter # 31524.

April 2, 1907.

Dynamometer reading	True amperes	Ammeter reading
14.7	4.27	4.4
23.0	5.3	5.42
30.0	6.05	6.2
43.5	7.3	6.97
48.3	7.71	7.75
60.0	8.61	8.53
72.7	9.57	9.35
85.0	10.22	10.1
100.2	11.11	10.83
115.1	11.94	11.64
131.0	12.78	12.45
144.0	13.41	13.1
162.0	14.3	13.88
176.5	14.95	14.47
194.0	15.7	:15.2


Transmission Ratio Test Machine
Calibration Curve
Apr. 11, 1929
Actual Ratio
True Ratio
EUGENE DIETZGEN CO., CHICAGO.

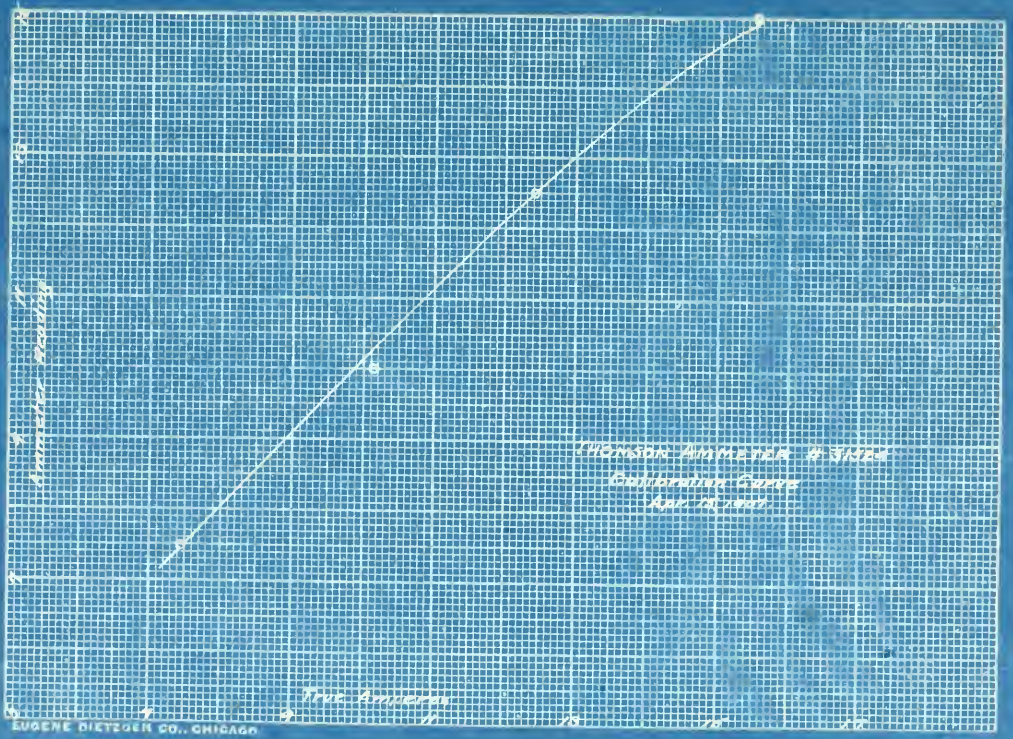
Calibration of Thomson Ammeter # 31524.

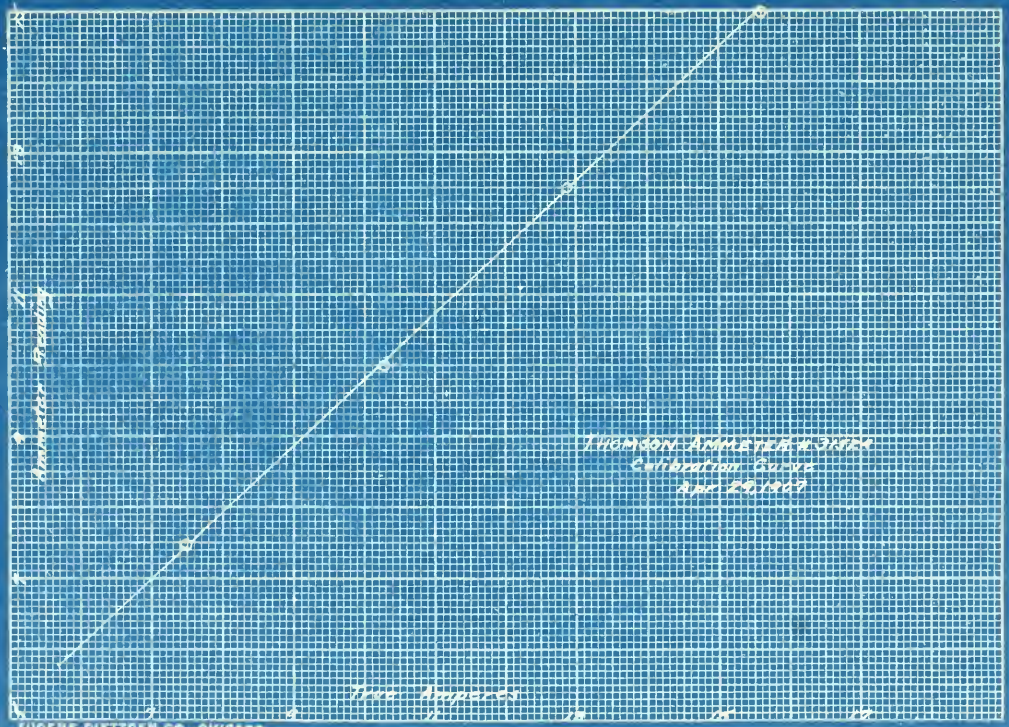
April 15 , 1907.

Dynamometer reading	True amperes	Ammeter reading
19.0	4.45	5.0
44.9	7.48	7.5
83.0	10.16	10.0
132.0	12.42	12.5
190.0	15.53	15.0

April 29, 1907.

Dynamometer reading	True amperes	Ammeter reading
46.0	7.5	7.5
85.0	10.3	10.0
133.5	12.9	12.5
193.0	15.6	15.0


EUGENE DIETZGEN CO., CHICAGO


Thomson Ammeter Plotter
Calibration Curve
Apr 29 1907
Arbitrary Scale
Mean Amperes
EUGENE DIETZGEN CO., CHICAGO.

Calibration of Weston Wattmeter # 3076.

April 2, 1907.

Amperes	Volts	Watts
1	110	104.25
2	"	213.25
3	"	324.0
4	"	431.5
5	"	541.25

April 15, 1907.

Amperes	Volts	Watts
1	110	105.5
2	"	215.5
3	"	324.25
4	"	433.0
5	"	544.5

April 29, 1907.

Amperes	Volts	Watts
1	110	107.5
2	"	216.0
3	"	325.5
4	"	434.0
5	"	546.5

Western Mountain Region
Mountain Peaks
Mountain Passes
Mountain Ranges
Mountain Streams
Mountain Valleys
Mountain Forests
Mountain Lakes
Mountain Rivers
Mountain Trails
Mountain Roads
Mountain Towns
Mountain Cities
Mountain Airports
Mountain Railroads
Mountain Highways
Mountain Bridges
Mountain Tunnels
Mountain Dams
Mountain Reservoirs
Mountain Power Plants
Mountain Mines
Mountain Quarries
Mountain Oil Fields
Mountain Gas Fields
Mountain Coal Fields
Mountain Iron Fields
Mountain Copper Fields
Mountain Gold Fields
Mountain Silver Fields
Mountain Lead Fields
Mountain Zinc Fields
Mountain Uranium Fields
Mountain Rare Earth Fields
Mountain Precious Stones
Mountain Semi-Precious Stones
Mountain Industrial Minerals
Mountain Agricultural Products
Mountain Livestock
Mountain Wildlife
Mountain Fish
Mountain Birds
Mountain Plants
Mountain Trees
Mountain Flowers
Mountain Grasses
Mountain Shrubs
Mountain Vines
Mountain Mosses
Mountain Lichens
Mountain Fungi
Mountain Bacteria
Mountain Viruses
Mountain Parasites
Mountain Diseases
Mountain Pests
Mountain Predators
Mountain Prey
Mountain Food Chains
Mountain Ecosystems
Mountain Biomes
Mountain Climate
Mountain Weather
Mountain Seasons
Mountain Temperature
Mountain Precipitation
Mountain Humidity
Mountain Wind
Mountain Storms
Mountain Lightning
Mountain Thunder
Mountain Rainbows
Mountain Sunsets
Mountain Sunrises
Mountain Moonlight
Mountain Starlight
Mountain Darkness
Mountain Silence
Mountain Echoes
Mountain Shadows
Mountain Reflections
Mountain Mirages
Mountain Illusions
Mountain Legends
Mountain Myths
Mountain Folklore
Mountain Songs
Mountain Dances
Mountain Festivals
Mountain Customs
Mountain Traditions
Mountain Languages
Mountain Dialects
Mountain Accents
Mountain Names
Mountain Nicknames
Mountain Slang
Mountain Jargon
Mountain Code
Mountain Signals
Mountain Smoke Signals
Mountain Drums
Mountain Horns
Mountain Whistles
Mountain Bells
Mountain Chimes
Mountain Gongs
Mountain Cymbals
Mountain Tambourines
Mountain Rattles
Mountain Shakers
Mountain Maracas
Mountain Castanets
Mountain Triangles
Mountain Xylophones
Mountain Marimbas
Mountain Vibraphones
Mountain Glockenspiels
Mountain Chimes
Mountain Tubular Bells
Mountain Timpani
Mountain Snare Drums
Mountain Bass Drums
Mountain Tom-Toms
Mountain Bongos
Mountain Conga Drums
Mountain Timbales
Mountain Cowbells
Mountain Woodblocks
Mountain Claves
Mountain Guiros
Mountain Cabasas
Mountain Agogo Bells
Mountain Whistles
Mountain Sirens
Mountain Foghorns
Mountain Trumpets
Mountain Cornets
Mountain Flugelhorns
Mountain Trombones
Mountain Euphoniums
Mountain Tubas
Mountain Sousaphones
Mountain French Horns
Mountain Mellophones
Mountain Baritones
Mountain Saxophones
Mountain Clarinets
Mountain Oboes
Mountain English Horns
Mountain Bassoons
Mountain Contrabassoons
Mountain Flutes
Mountain Piccolos
Mountain Recorders
Mountain Ocarinas
Mountain Pan Flutes
Mountain Harmonicas
Mountain Accordions
Mountain Concertinas
Mountain Bagpipes
Mountain Hurdy-Gurdies
Mountain Organs
Mountain Pianos
Mountain Harpsichords
Mountain Clavichords
Mountain Celestas
Mountain Synthesizers
Mountain Electronic Keyboards
Mountain Guitars
Mountain Basses
Mountain Banjos
Mountain Mandolins
Mountain Ukuleles
Mountain Harps
Mountain Lutes
Mountain Zithers
Mountain Dulcimers
Mountain Autoharps
Mountain Violins
Mountain Violas
Mountain Cellos
Mountain Double Basses
Mountain Fiddles
Mountain Hammered Dulcimers
Mountain Steel Drums
Mountain Theremins
Mountain Ondes Martenot
Mountain Electric Guitars
Mountain Electric Basses
Mountain Electric Violins
Mountain Electric Cellos
Mountain Electric Double Basses
Mountain Electric Pianos
Mountain Electric Organs
Mountain Electric Harpsichords
Mountain Electric Clavichords
Mountain Electric Celestas
Mountain Electric Synthesizers
Mountain Electric Keyboards
Mountain Electric Guitars
Mountain Electric Basses
Mountain Electric Violins
Mountain Electric Cellos
Mountain Electric Double Basses
Mountain Electric Pianos
Mountain Electric Organs
Mountain Electric Harpsichords
Mountain Electric Clavichords
Mountain Electric Celestas
Mountain Electric Synthesizers
Mountain Electric Keyboards

EUGENE DIETZGEN CO. CHICAGO

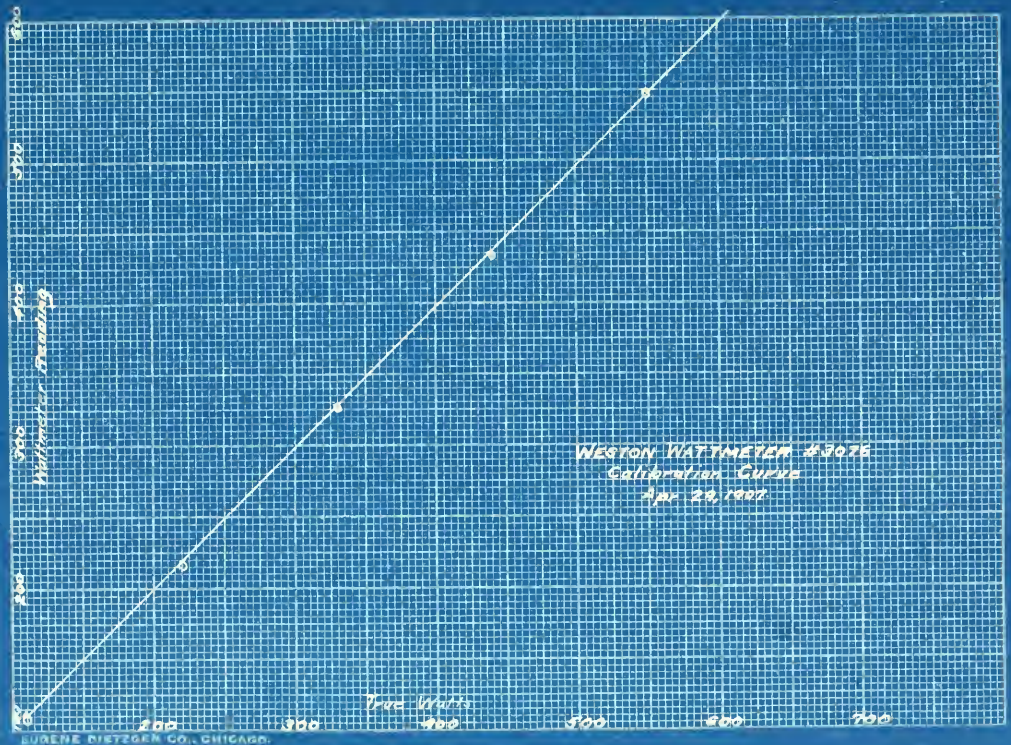
MADE IN U.S.A.

Wavelength Reading

100 200 300 400 500 600 700 800

Ruby Filter

COMPARATIVE DEGREE OF TRANSPARENCY
OF
SOLUTIONS OF WESTON WASTE METAL
AT
APR. 15, 1907


Weston Wattmeter #3078
Calibration Curve
Apr. 29, 1921
True Watts
Watts Indicated
0
100
200
300
400
500
600
700
EUGENE DIETZGEN CO., CHICAGO.

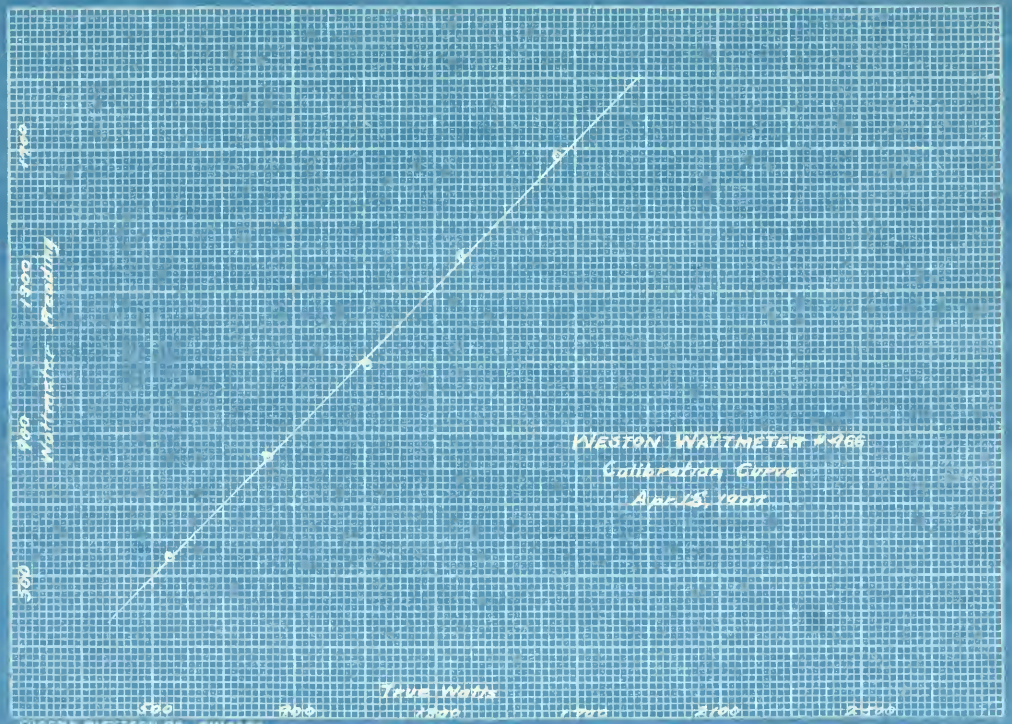
Calibration of Weston Wattmeter # 466.

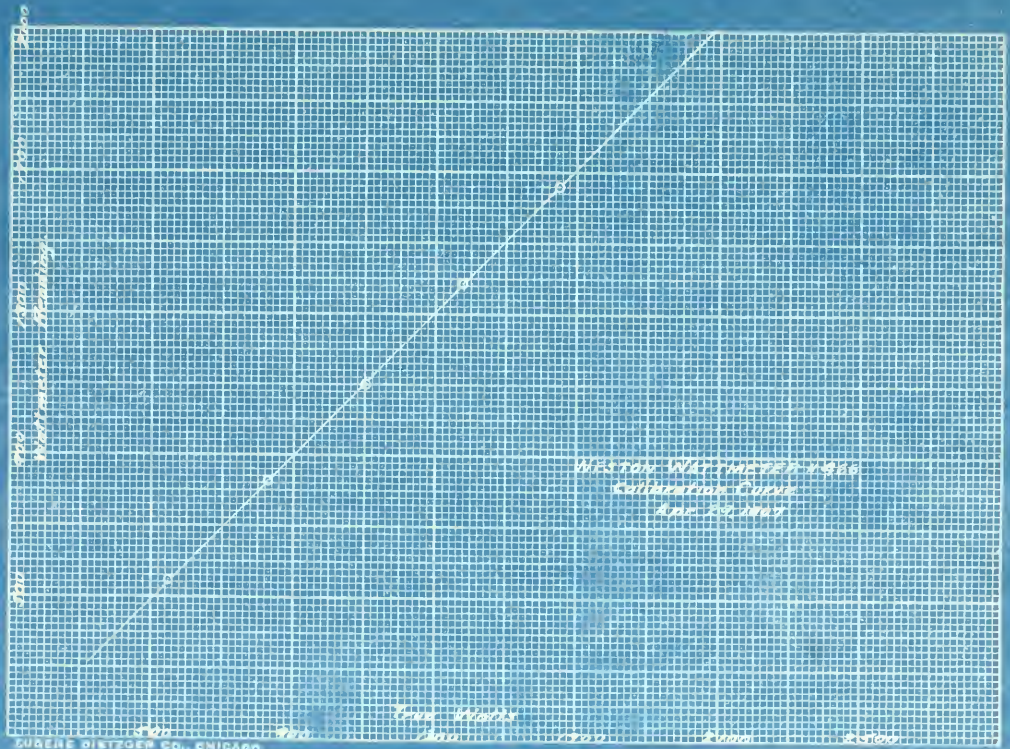
April 15,1907.

Amperes	Volts	Watts
5.0	110	549
7.5	"	835
10.0	"	1096
12.5	"	1399
15.0	"	1680

April 29, 1907.

Amperes	Volts	Watts
5.0	110	547.5
7.5	"	835.0
10.0	"	1105.0
12.5	"	1386.5
15.0	"	1666.5


WESTON WATTMETER #266
Calibration Curve
Apr. 25, 1924
True Watts
Apparent Watts
900
1000
1100
1200
2100
2200
EUGENE DIETZGEN CO., CHICAGO


Weston Wattmeter Watts
Full Load Watts
Load Volts
EUGENE DIETZGEN CO., CHICAGO.

DATA AND CURVES.

FORT WAYNE
INDUCTION WATTMETER

TYPE W

FORM S 1.4

No. 252944

KILOWATT HOURS

Fort Wayne Induction Wattmeter Type W.

Data showing the effect of change of load at normal voltage, frequency and unity power factor.

Potential = 111.3

Temperature = 63.53°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.45	285.6	284	99.5
12.8	237.8	238	100.2
10.2	185.2	187	101.0
7.53	137.8	137	99.5
5.0	93.0	92	99.0
4.0	73.1	72	98.5
3.03	56.1	55	98.0
2.00	36.5	35	95.9
1.09	20.2	19	94.0

Fort Wayne Induction Wattmeter Type W.

Data showing the effect of change of load at normal frequency and unity power factor and 75% normal voltage.

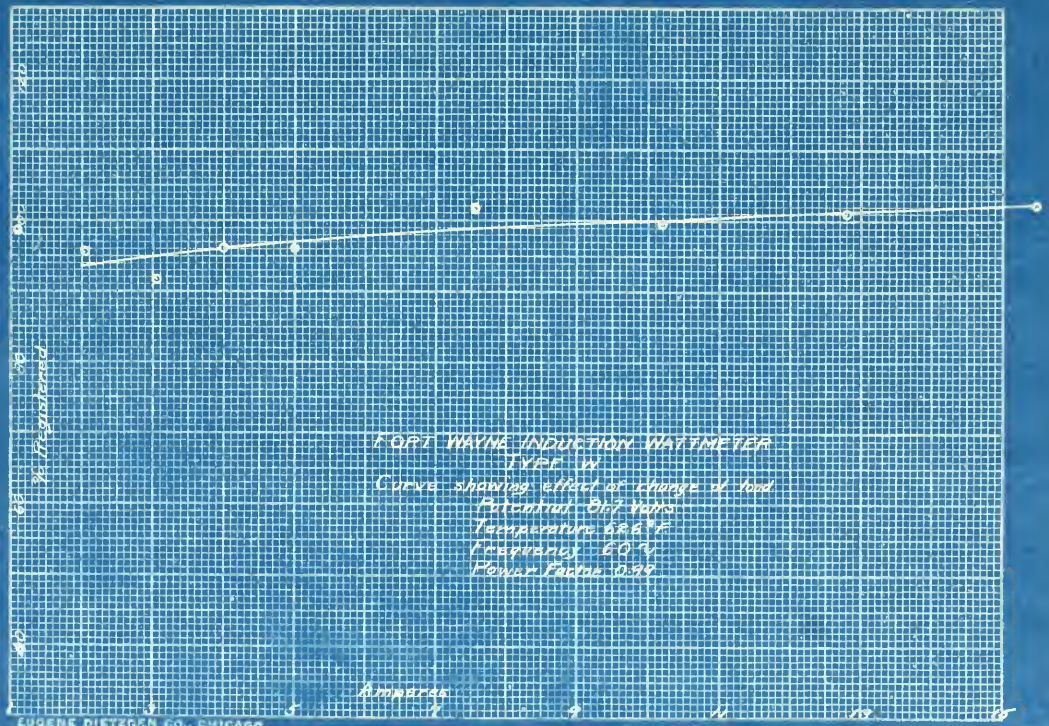
Potential = 81.7 volts

Temperature = 62.6°F.

Frequency = 60 cycles/sec.

Power factor = .99

Current	Watt-hours measured	Watt-hours registered	% registered
15.45	104.4	107	102.3
12.8	86.0	87	101.0
10.2	69.3	69	99.5
7.53	51.2	52	101.6
5.0	35.4	34	96.0
4.0	28.1	27	96.0
3003	21.8	20	91.7
2.02	13.6	13	95.5
1.05	7.1	7	98.5



EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

Data showing the effect of change of load at normal frequency, unity power factor and 90% normal voltage.

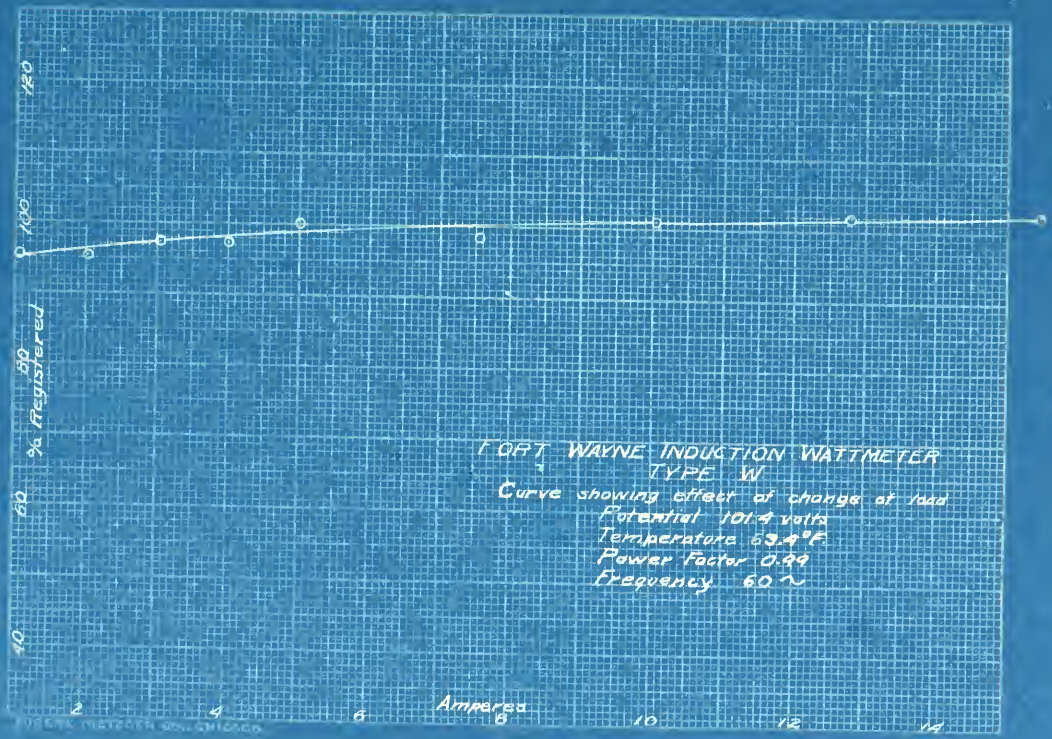
Potential = 101.4 volts

Temperature = 63.4°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.45	128	131	102.5
12.8	107	109	102.0
10.2	86.3	87	101.0
7.53	62.9	62	98.5
5.0	43.0	43	100.0
4.0	34.0	33	97.2
3.03	27.8	27	97.2
2.02	16.8	16	95.2
1.05	8.4	8	95.2


120
100
80
60
40
% Registered
2
4
6
8
10
12
14
Amperes
FORT WAYNE INDUCTION WATTMETER
TYPE W
Curve showing effect of change of load
Potential 101.4 volts
Temperature 63.4°F
Power Factor 0.99
Frequency 60 ~

Fort Wayne Induction Wattmeter Type W.

Data showing the effect of change of load at normal frequency, unity power factor and 110% normal voltage.

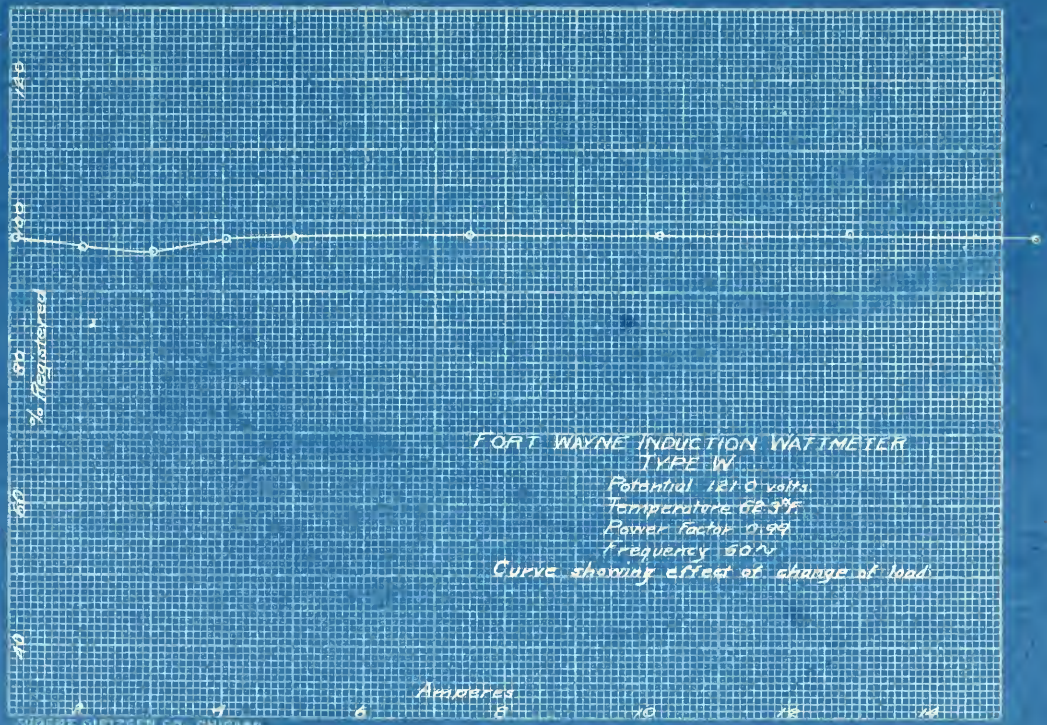
Potential = 121 volts

Temperature = 62.3°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.45	156.8	153	97.6
12.85	130.0	128	98.3
10.16	101.0	99	98.0
7.48	74.5	73	98.0
5.0	50.3	49	97.5
4.03	41.0	40	97.5
3.01	30.4	29	95.5
2.02	19.75	19	96.1
1.08	9.2	9	97.8


FORT WAYNE INDUCTION WATTMETER
TYPE W
Potential 121.0 volts
Temperature 62.3°F.
Power factor 0.99
Frequency 60.0
Curve showing effect of change of load
Amperes
Percentage %
SARGENT DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

Data showing the effect of change of load at normal voltage, unity power factor, and 66% normal frequency#

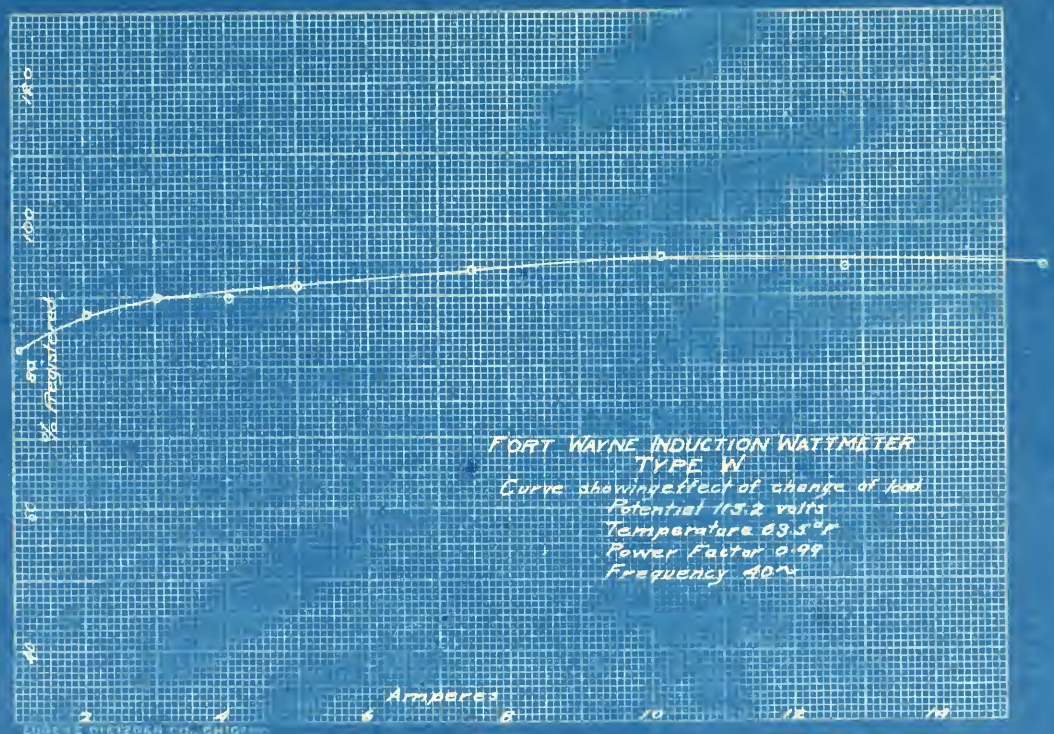
Potential = 113.2 volts

Temperature = 63.5°F.

Power factor = .99

Frequency = 40 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	143.8	135	94.0
12.85	117.0	110	94.0
10.16	93.5	89	95.1
7.48	69.5	65	93.6
5.0	48.2	44	91.4
4.03	37.1	34	91.6
3.01	27.8	25	89.9
2.02	18.3	16	87.5
1.08	8.5	7	82.5


% Registered
Amperes
2
4
6
8
10
12
14
FORT WAYNE INDUCTION WATTMETER
TYPE W
Curve showing effect of change of load
Potential 113.2 volts
Temperature 63.5° F
Power Factor 0.99
Frequency 40~

Fort Wayne Induction Wattmeter Type W.

Data showing the effect of change of loadat normal voltage, unity power factor and 133⅓% normal frequency.

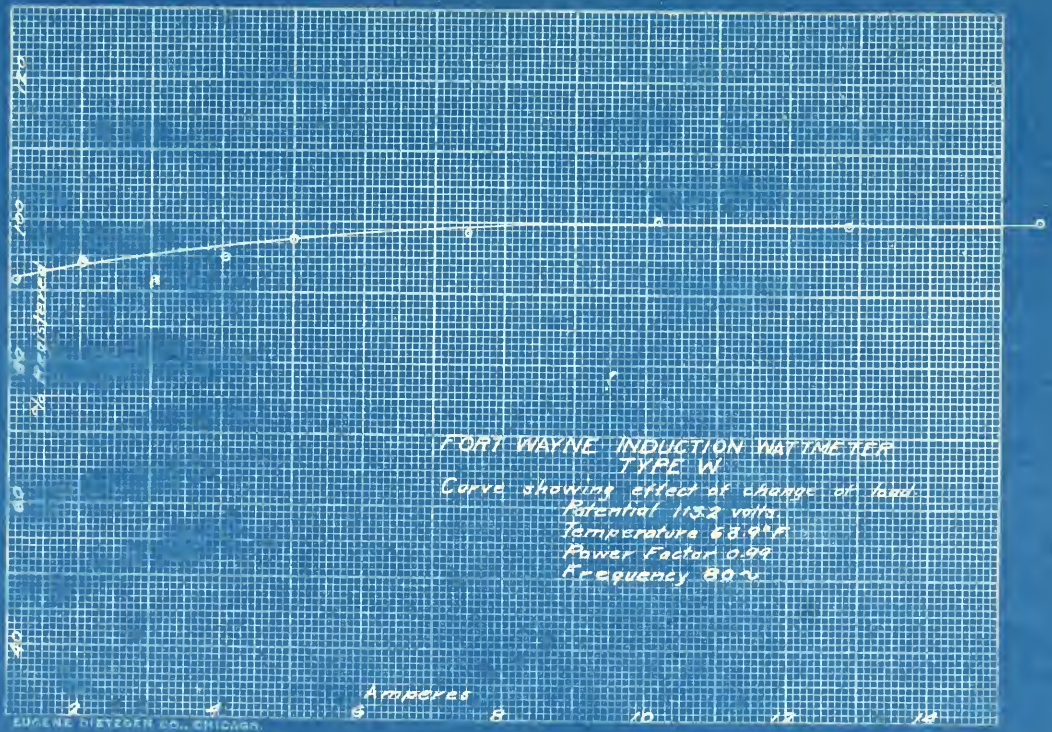
Potential = 113.2 volts

Temperature = 63.9°F.

Power factor = .99

Frequency = 80 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	142.1	143	100.6
12.85	117.1	117	99.9
10.16	93.6	94	100.3
7.48	68.8	68	98.7
5.0	46.2	45	97.3
4.03	37.9	36	95.0
3.01	28.4	26	91.6
2.02	19.15	18	94.0
1.08	8.73	8	91.6


FORT WAYNE INDUCTION WATTMETER
TYPE W
Curve showing effect of change of load.
Potential 115.2 volts
Temperature 68.9°F
Power Factor 0.99
Frequency 80 ~
Amperes
Percentage
EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

Data showing the effect of change of load at normal voltage and frequency and 75% power factor.

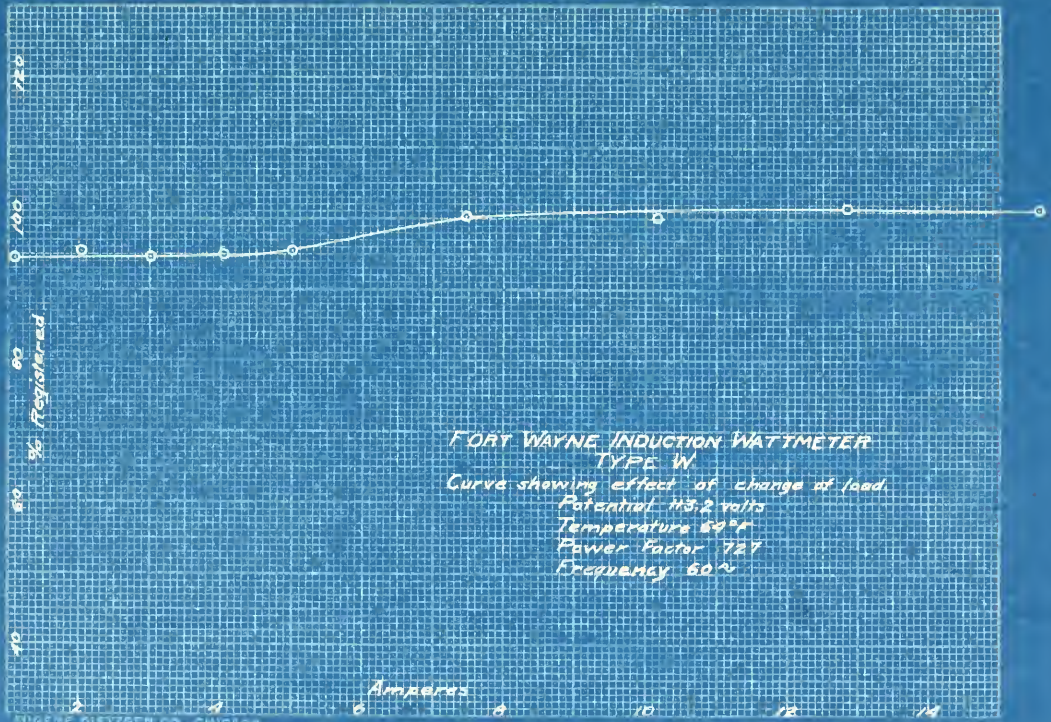
Potential = 113.2 volts

Temperature = 64°F.

Power factor = .727

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registerdd	% registered
15.53	101.7	103	101.2
12.85	84.5	86	101.7
10.16	68.0	68	100.0
7.48	50.8	51	100.3
5.0	34.6	33	95.5
4.03	27.4	26	95.0
3.01	22.2	21	94.7
2.02	13.6	13	95.5
1.98	7.4	7	94.6



EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

Data showing the effect of change of load at normal voltage and frequency and 50% power factor.

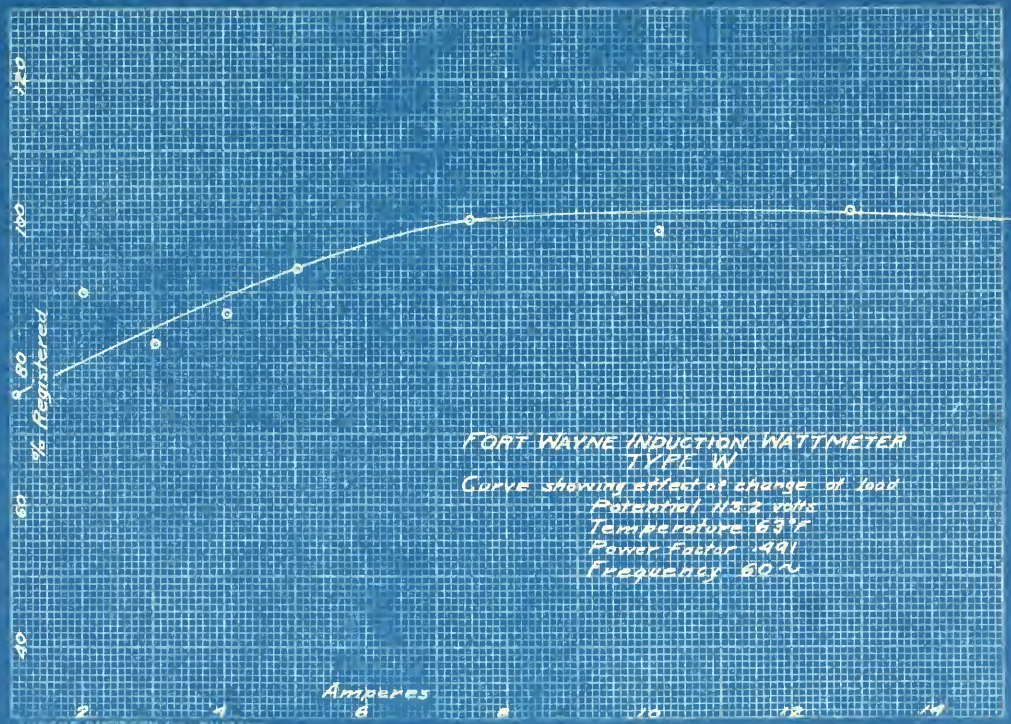
Potential = 113.2 volts

Temperature = 63° F.

Power factor = .491

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	68	68	100.0
12.85	57.2	58	101.5
10.16	46.6	46	98.7
7.48	56.0	56	100.0
5.0	22.5	21	93.4
4.03	19.5	17	87.0
3.01	14.5	12	82.8
2.02	10.0	9	90.0
1.08	5.3	4	75.5



LUDGIN DIETZGEN CO., CHICAGO

Fort Wayne Induction Wattmeter Type W,

Data showing the effects of change of load at normal voltage and frequency, and unity power factor.

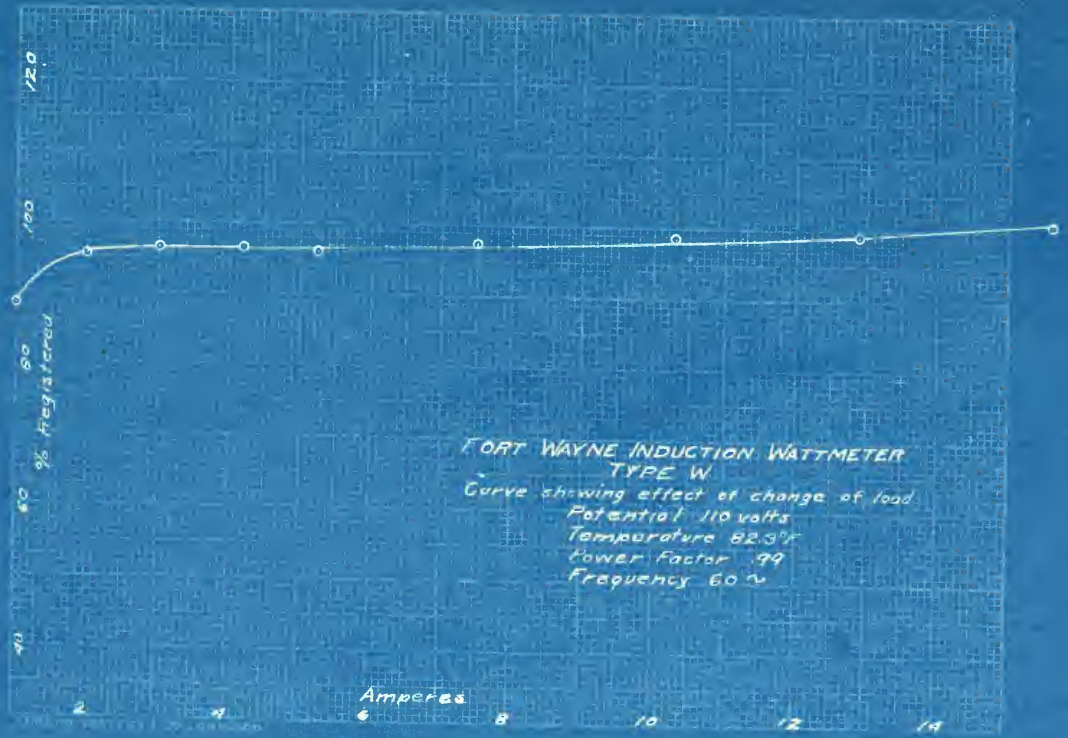
Potential = 110 volts

Temperature = 82.3°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	137.6	139	101.0
12.9	116.2	115	99.0
10.3	91.3	91	98.5
7.5	66.6	65	97.5
5.25	44.8	43	96.0
4.18	36.2	35	96.6
3.02	26.9	26	96.6
2.00	17.8	17	95.5
0.98	10.2	9	88.2



FORT WAYNE INDUCTION WATTMETER
TYPE W
Curve showing effect of change of load
Potential 110 volts
Temperature 82.3°F
Power Factor .99
Frequency 60 ~

Fort Wayne Induction Wattmeter Type W.

Data showing the effectof change of load at normal voltage and frequency,and unity power factor.

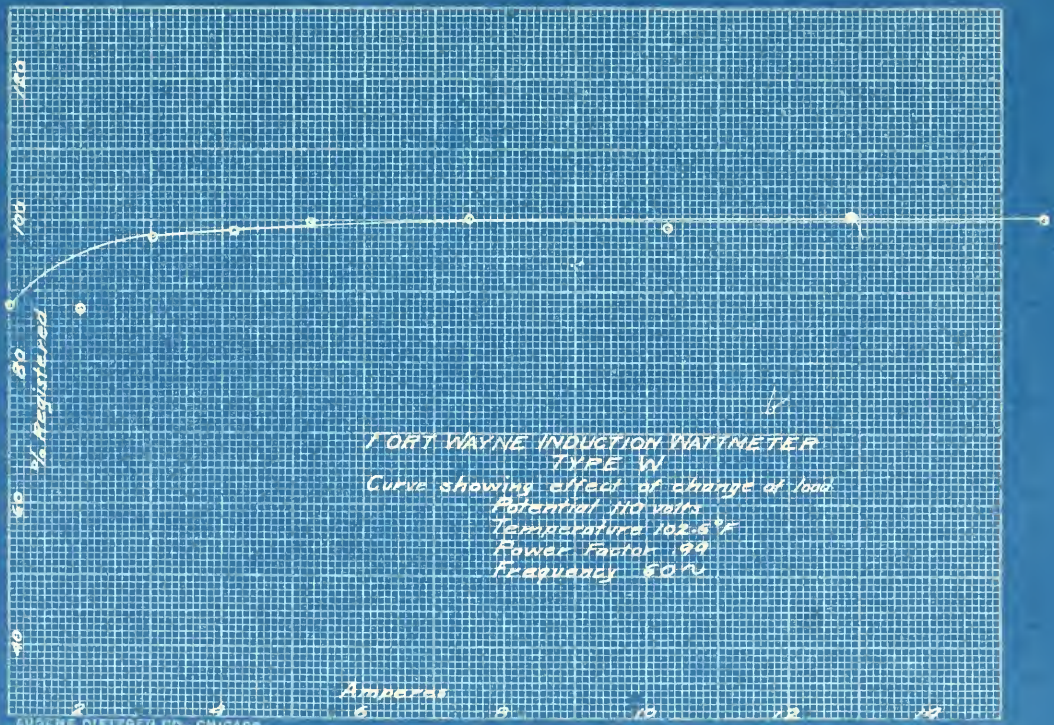
Potential = 110 volts

Temperature = 102.6°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	138.1	139	100.5
12.9	115.0	116	100.8
10.3	91.0	90	99.0
7.5	66.8	67	100.2
5.25	45.1	45	99.8
4.18	36.6	36	98.3
3.02	26.6	26	97.7
2.00	17.2	15	87.3
0.98	9.06	8	88.2



EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

Data showing the effect of change of load at normal voltage and frequency, and unity power factor.

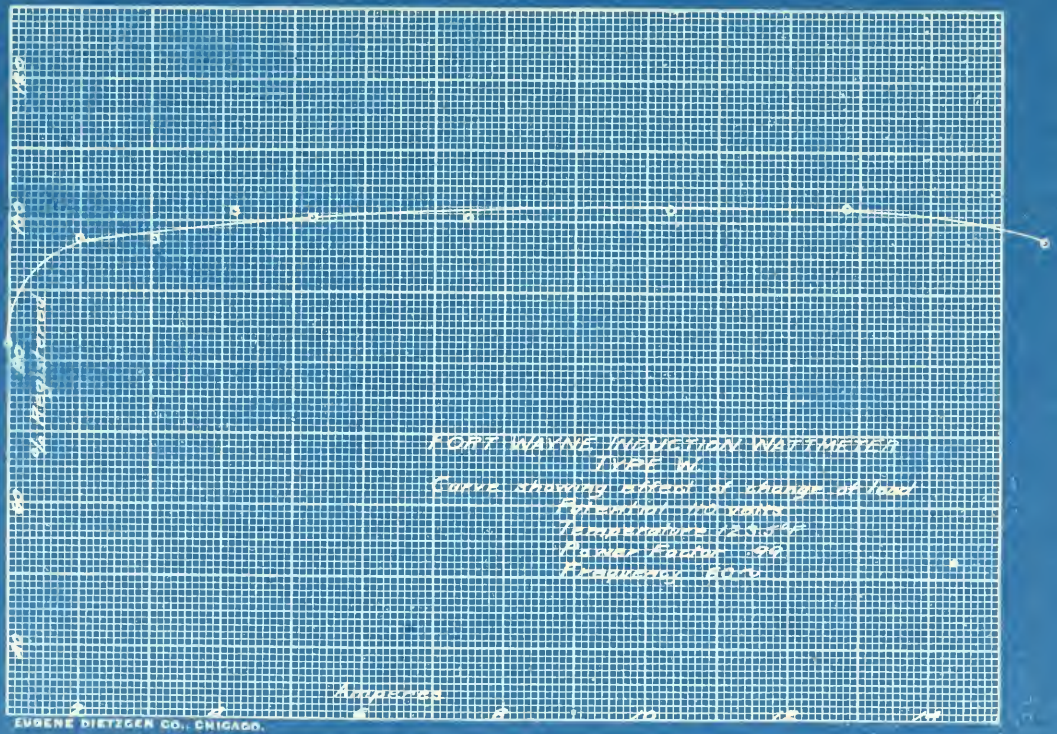
Potential = 110 volts

Temperature = 123.5°F.

Power factor =.99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	140.0	137	98.5
12.7	115.5	118	102.0
10.3	90.3	92	102.
7.5	67.8	68	100.2
5.25	44.8	45	100.3
4.18	35.5	36	101.3
3.02	26.75	26	97.2
2.00	17.4	17	97.6
0.98	8.65	8	82.5


FORT WAYNE, INDIANA, WATER WORKS
Curve showing effect of change in head
EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

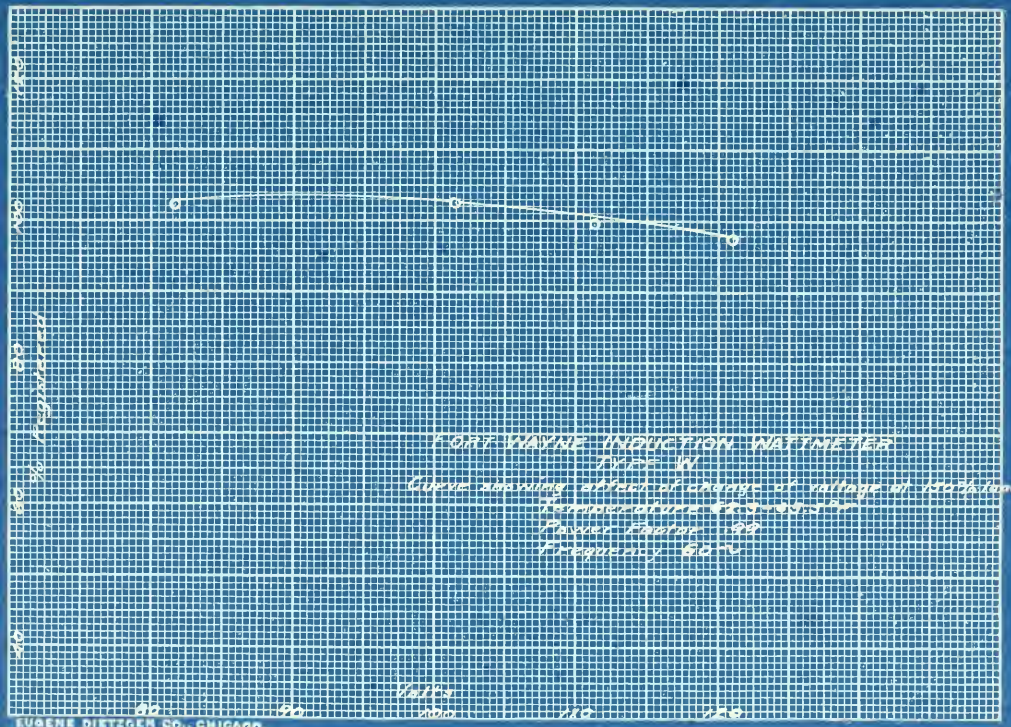
Data showing the effect of change of voltage at 150% load.

Temperature = 62.3-63.5°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
15.45	81.7	102.3
15.45	101.4	102.5
15.45	111.3	99.5
15.53	121.0	97.6


"GOFF" PHASE INDUCTION WATTMETER
Curve showing effect of change of voltage at no load
Power Factor 98
Frequency 60~
EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

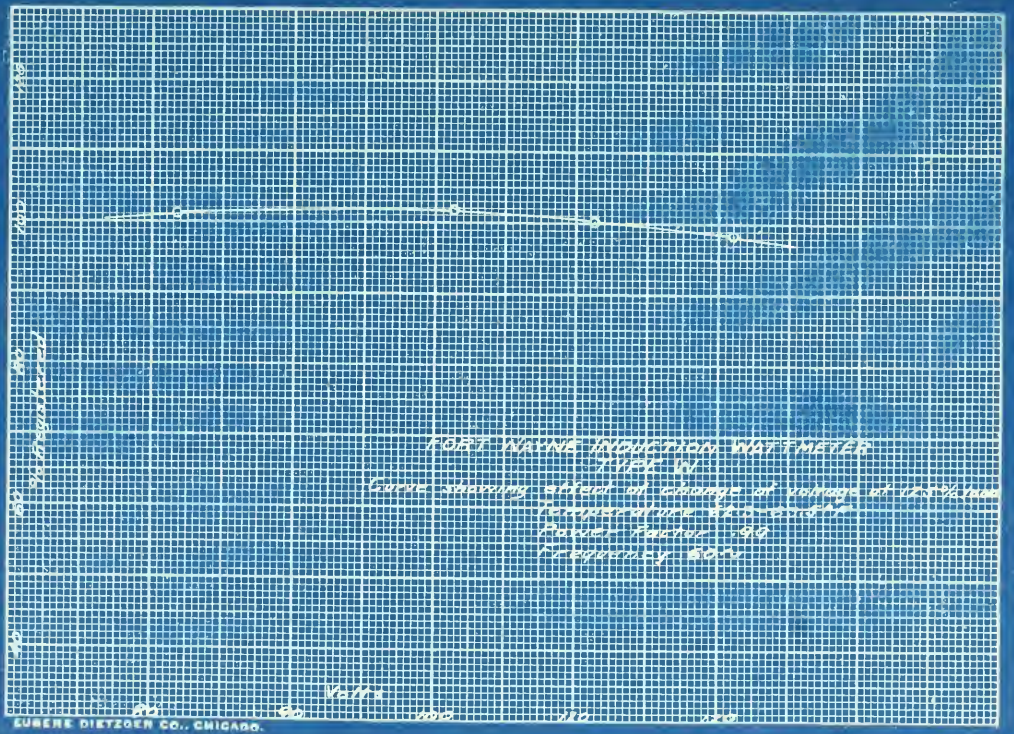
Data showing the effect of change of voltage at 125% load.

Temperatyre = 62.3 - 63.5°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
12.8	81.7	101.0
12.8	101.4	102.0
12.8	111.3	100.2
12.85	121.0	98.3


FORT WAYNE INDUSTRIES WATER METER
Curve showing actual percentage of registration
Velocity in Feet per Second
Percentage of Registration
Velocity in Feet per Second
EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

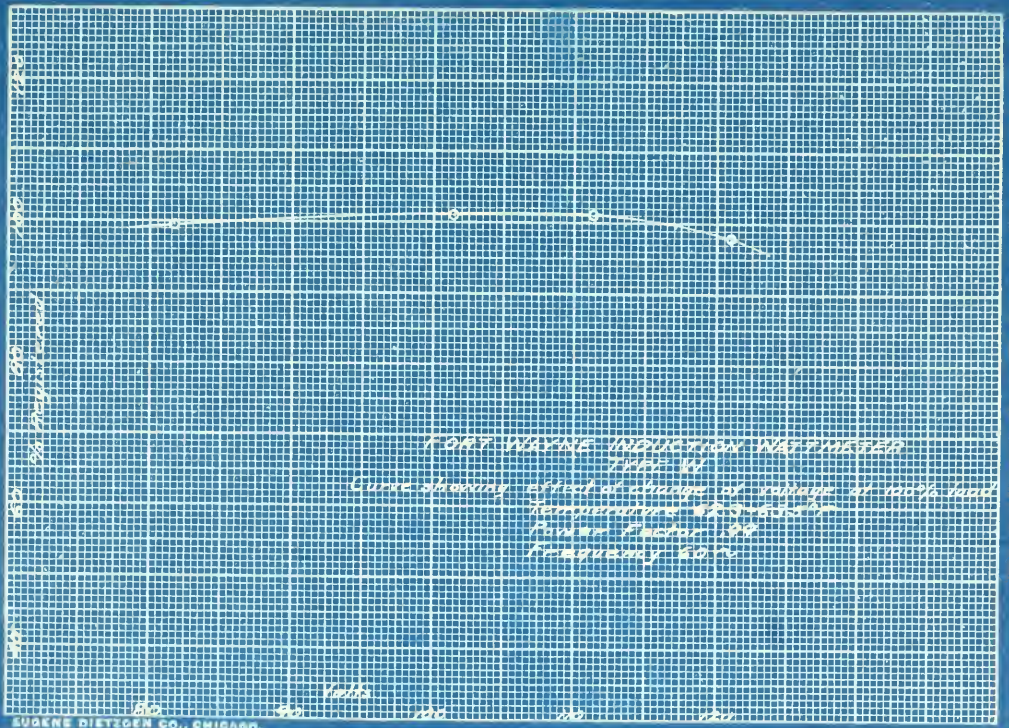
m Data showing the effect of change of voltage at 100% load,

Temperature = 62.3 -63.5°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
10.2	81.7	99.5
10.2	101.4	101.0
10.2	111.3	101.0
10.16	121.0	98.0


EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

Data showing the effect of change of voltage at 75% load.

Temperature = 62.3 - 63.5

Power faction = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
7.53	81.7	101.6
7.53	101.4	98.5
7.53	111.3	99.5
7.48	121.0	98.0

Port Wayne Induction Wattmotor Type W.

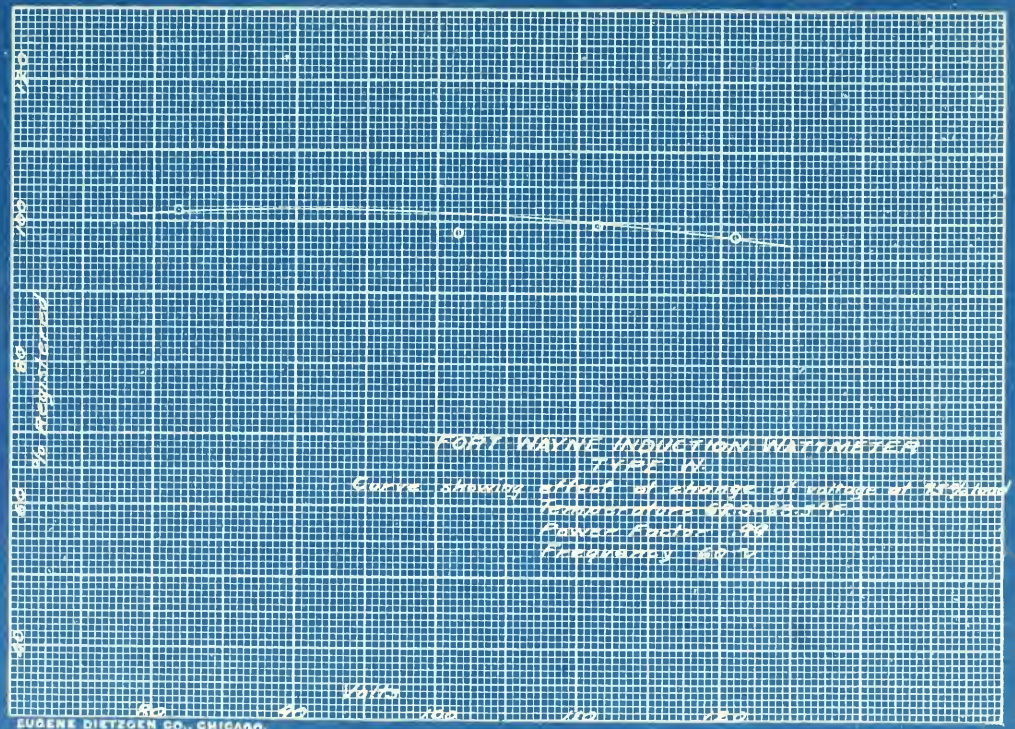
Data showing the effect of change of voltage at 75% load.

Temperature = 62.3 - 63.6

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	Registered %
7.53	121.7	101.6
7.53	101.4	85.5
7.55	111.3	93.3
7.46	121.0	99.0


FORT WAYNE INDUCTION WATTMETER
Curve showing effect of change of voltage on registration
Power Factor 50
Frequency 60
Volts
EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

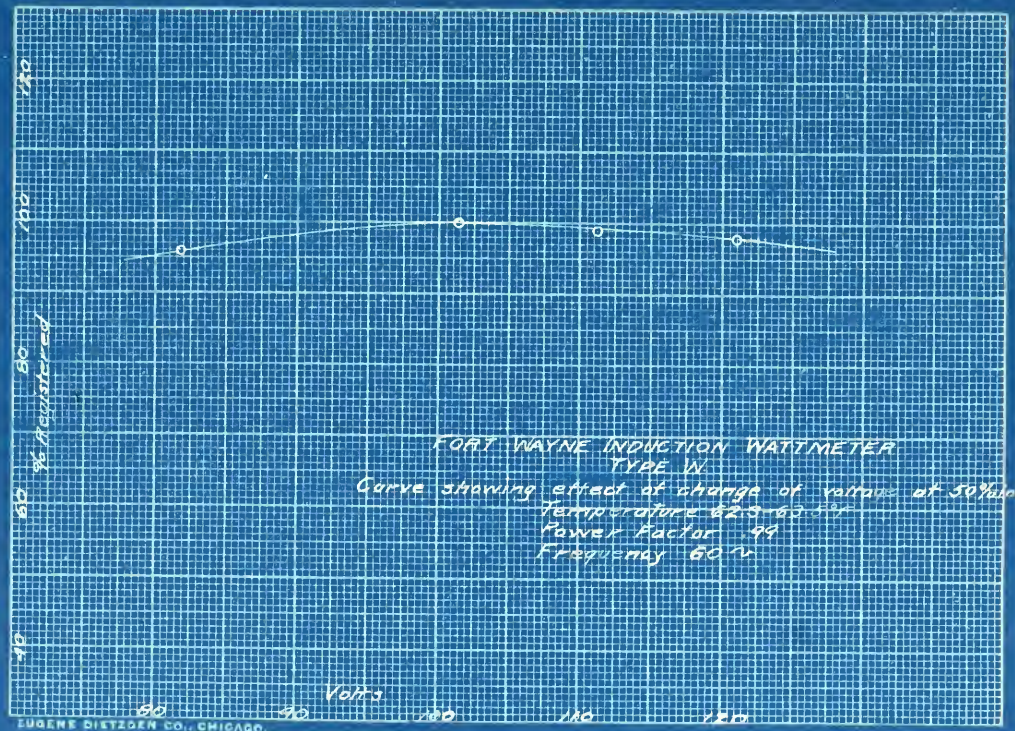
Data showing the effect of change of voltage at 50% load.

Temperature = 62.3 - 63.5°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
5.0	81.7	96.0
5.0	101.4	100.0
5.0	111.3	99.0
5.0	121.0	97.5



FORT WAYNE INDUCTION WATTMETER
TYPE W.
Curve showing effect of change of voltage at 50% load
Temperature 82°-69.5°C
Power Factor .99
Frequency 60 ~

EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

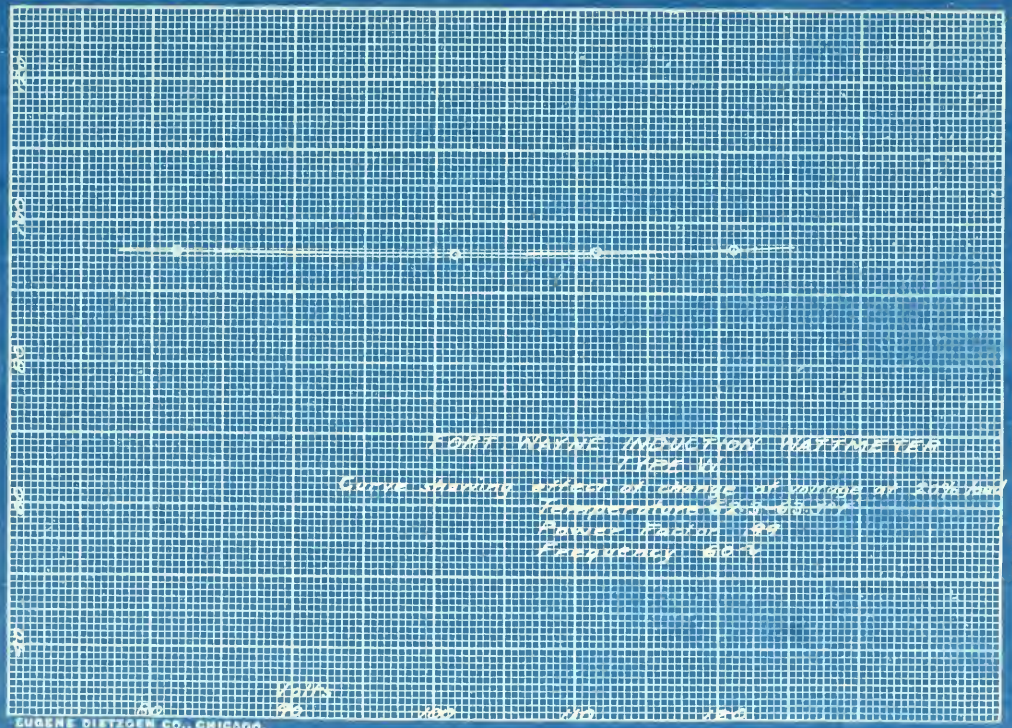
Data showing the effect of change of voltage at 20% load.

Temperature = 62.3 - 63.5°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
2.02	81.7	95.5
2.02	101.4	95.2
2.00	111.3	95.9
2.02	121.0	96.1


Power Factor Induction Motor Test
Curve showing relation of power factor and efficiency
Power factor
Efficiency
Watts
EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

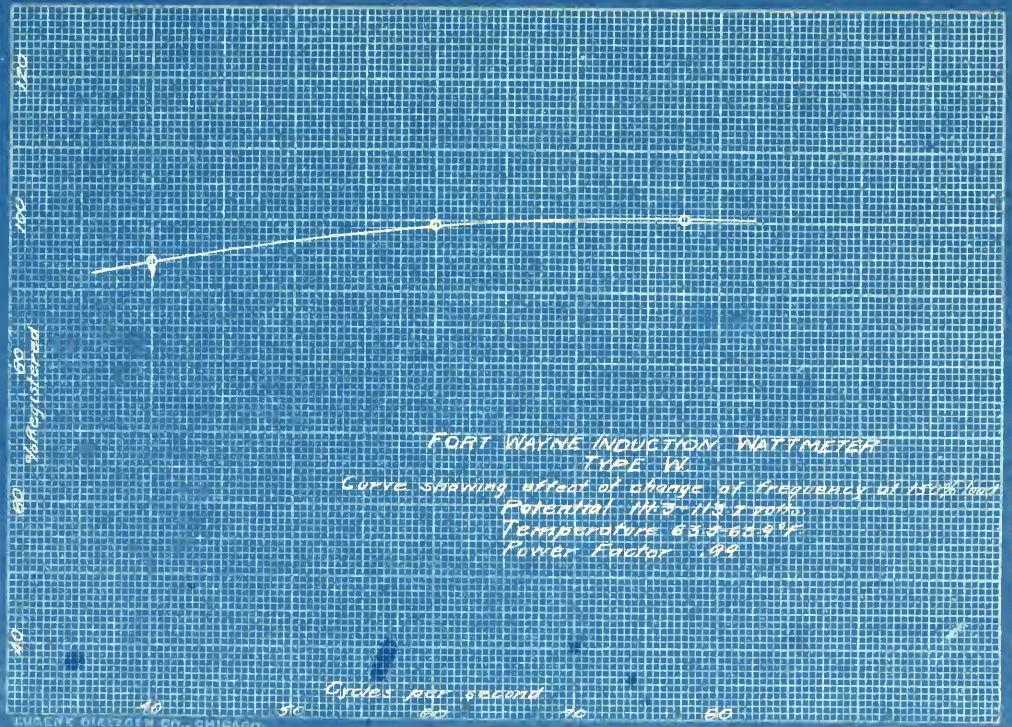
Data showing the effect of change of frequency at 150% load,

Potential = 111.3 - 113.2 volts

Temperature = 63.5 - 63.9°F.

Power factor = .99

Current	Frequency	% Registered
15.53	40	94.0
15.45	60	99.5
15.53	80	100.6



FORT WAYNE INDUCTION WATTMETER
TYPE W
Curve showing effect of change of frequency at 100% load
Potential 113-118 Volts
Temperature 83.5-86.5°F.
Power Factor .99

Fort Wayne Induction Wattmeter Type W.

Data showing the effect of change of frequency at 125% load.

Potential = 111.3 - 113.2 volts

Temperature = 63.5 - 63.9

Power factor = .99

Current	Frequency	% Registered
12.85	40	94.0
12.80	60	100.2
12.85	80	99.9

Curve showing Registration Maximum
Point Maine Institute of Technology
Portland, Maine
Curve showing Registration Maximum
Point Maine Institute of Technology
Portland, Maine

Fort Wayne Induction Wattmeter TYpe W.

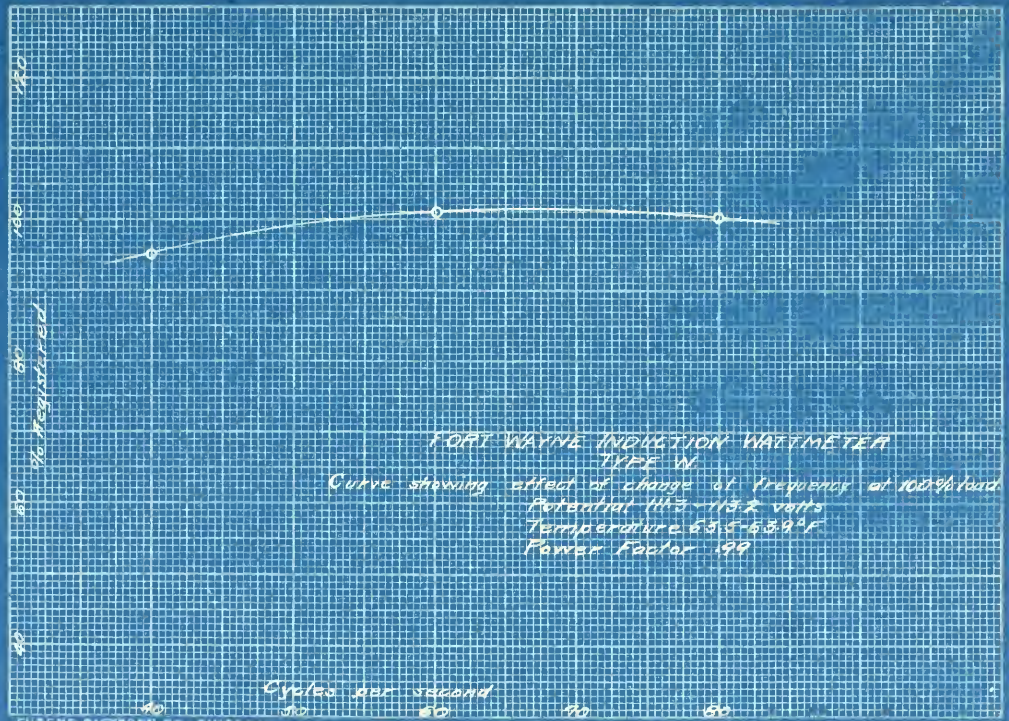
Data showing the effect of change of frequency at 100% load.

Potential = 111.3 - 113.2 volts

Temperature = 63.5 - 63.9°F.

Power factor = .99

Current	Frequency =	% Registered
10.16	40	95.1
10.2	60	101.0
10.16	80	100.3



EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

Data showing the effect of change of frequency at 75% load.

Potential = 111.3 -113.2 volts

Temperature = 63.5 - 63.9°F.

Power factor = .99

Current	Frequency	% Registered
7.48	40	93.6
7.53	60	99.5
7.48	80	98.7

Fig. 1. Recovery of Uranium from Solutions Containing Phosphate and Iron by Solvent Extraction with Ether.

Curve 1. Recovery of uranium from solutions containing 1.0 g. of phosphate (PO_4) and 0.5 g. of iron (Fe) per liter.

Curve 2. Recovery of uranium from solutions containing 0.5 g. of phosphate (PO_4) and 0.25 g. of iron (Fe) per liter.

Fort Wayne Induction Wattmeter Type W.

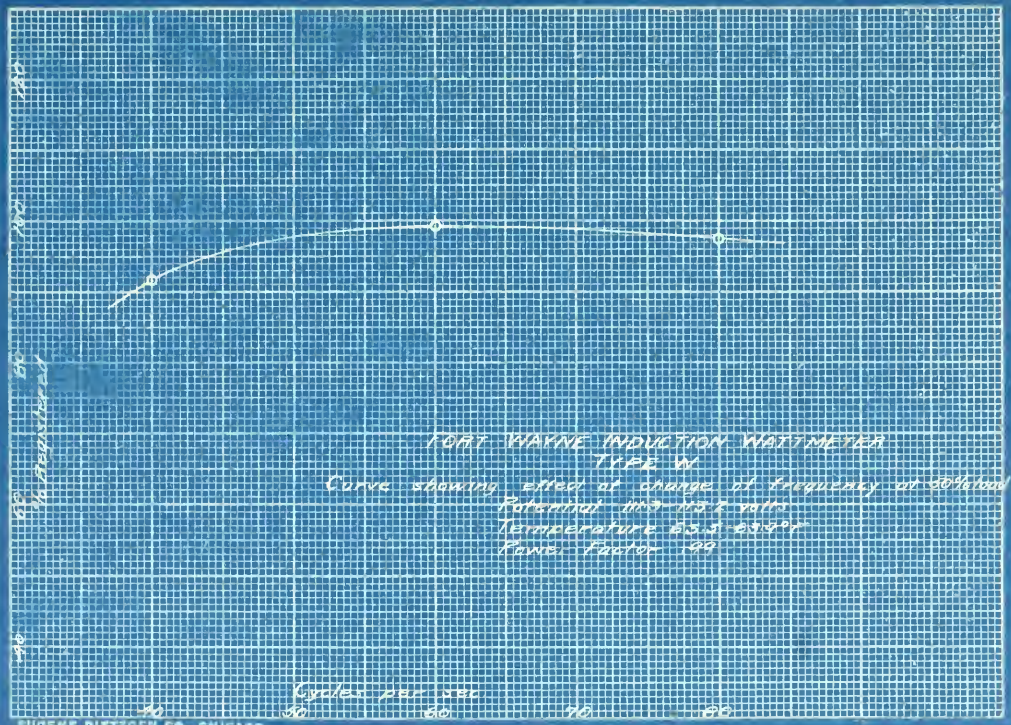
Data showing the effect of change of frequency at 50% load.

Potential = 111.3 - 113.2 volts

Temperature = 63.5 - 63.9°F.

Power factor = .99

Current	Frequency	% Registered
5.0	40	91.4
5.0	60	99.0
5.0	80	97.3



FORT WAYNE INDUCTION WATTMETER
TYPE W
Curve showing effect of change of Frequency at 60 Cycles
Potential and Load Coils
Temperature 25° C
Amps. Factor 1.00

EUGENE DIETZGEN CO., CHICAGO

Fort Wayne Induction Wattmeter TYPE W.

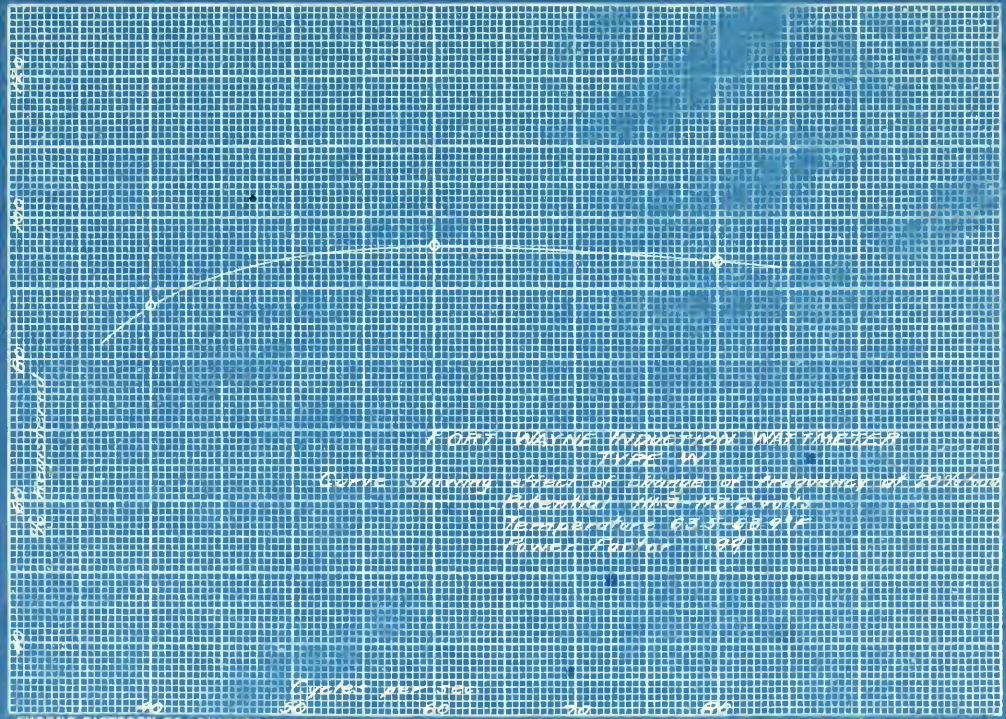
Data showing the effect of change of frequency at 20% load.

Potential = 111.3 - 113.3 volts

Temperature = 63.5 - 63.9°F.

Power factor = .99

Current	Frequency	% Registered
2.02	40	87.5
2.00	60	95.9
2.02	80	94.0



FORT WAYNE INDUCTION WATTMETER
TYPE M
Curve showing effect of change of temperature on accuracy
Calibrated with 60 cycles
Temperature 65° F. & 91° F.
Power Factor 1.00

EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

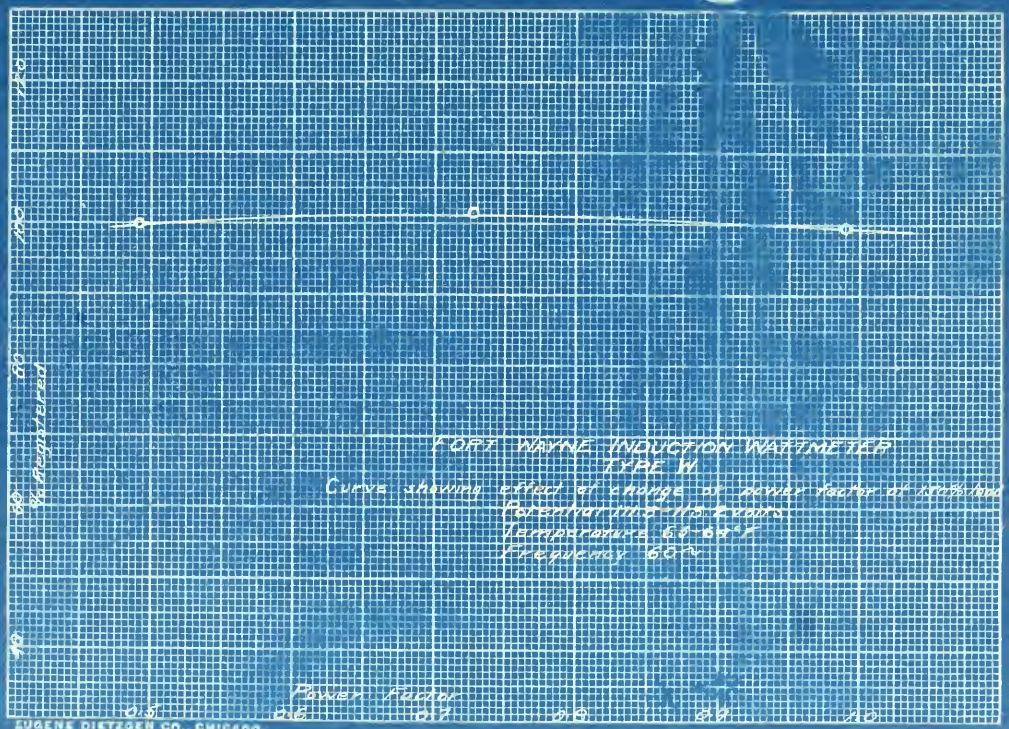
Data showing the effect of change of power factor at 150% load.

Potential = 111.3 - 113.2 volts

Temperature = 63 - 64°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
15.53	.491	100.0
15.52	.727	101.2
15.45	.99	99.5


FORT WAYNE INDUCTION WATTMETER
TYPE W
Curve showing effect of change of power factor at approximately
Rated Load and Normal
Temperature 68°-68°F
Frequency 60~
% Registered
Power Factor
EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

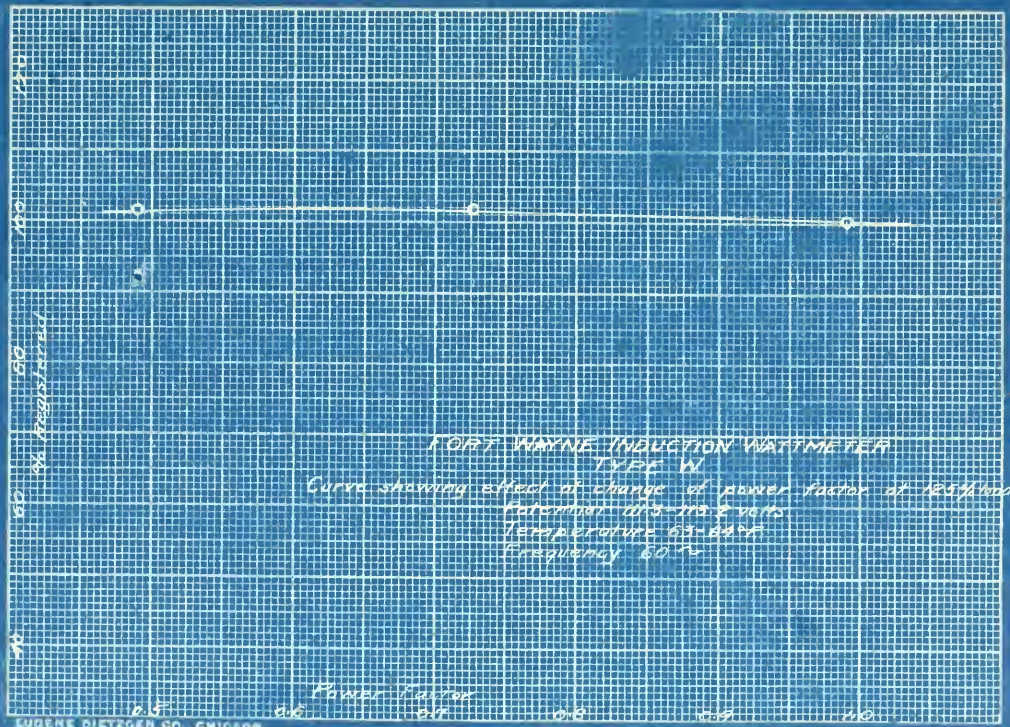
Data showing the effect of change of power factor at 125% load.

Potential = 111.3 - 113.2 volts

Temperature = 63 - 64°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
12.85	.491	101.5
12.85	.727	101.7
12.90	.99	100.2



EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W .

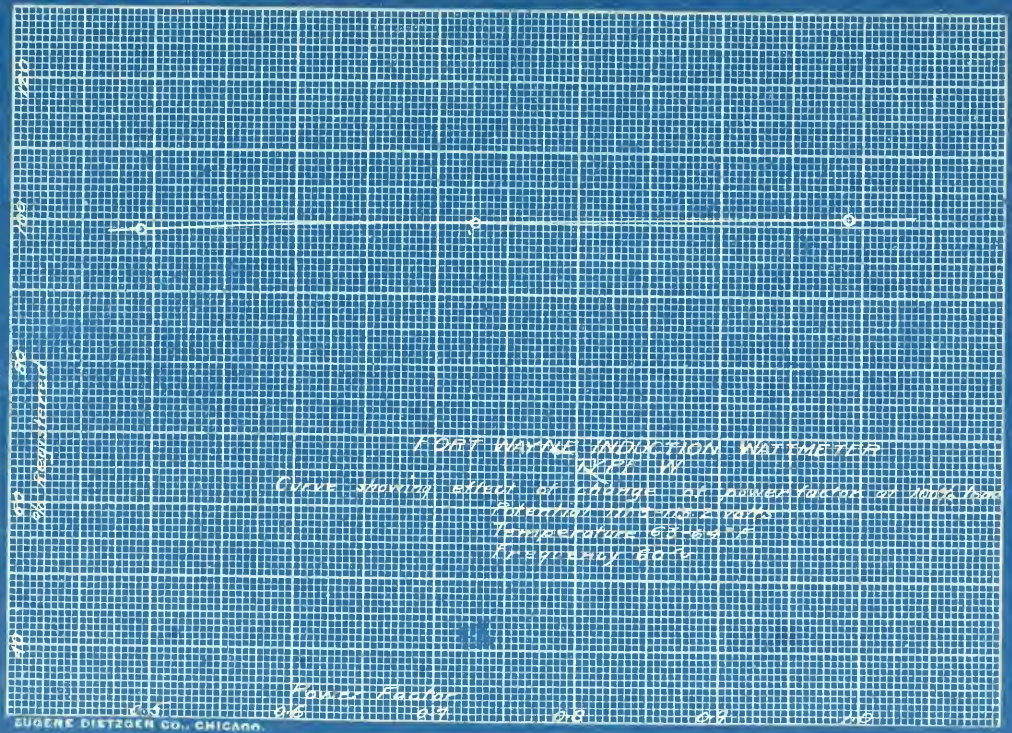
Data showing the effect of change of power factor at 100%load.

Potential = 111.3 - 113.2 volts

Temperature = 63 - 64°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
10.16	.491	98.7
10.18	.727	100.0
10.2	.99	101.0


FORT WAYNE INDUCTION WATTMETER
Curve showing effect of change of power factor on watt flow
Frequency 60 cycles
Temperature 65°-85°F
Power Factor
EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

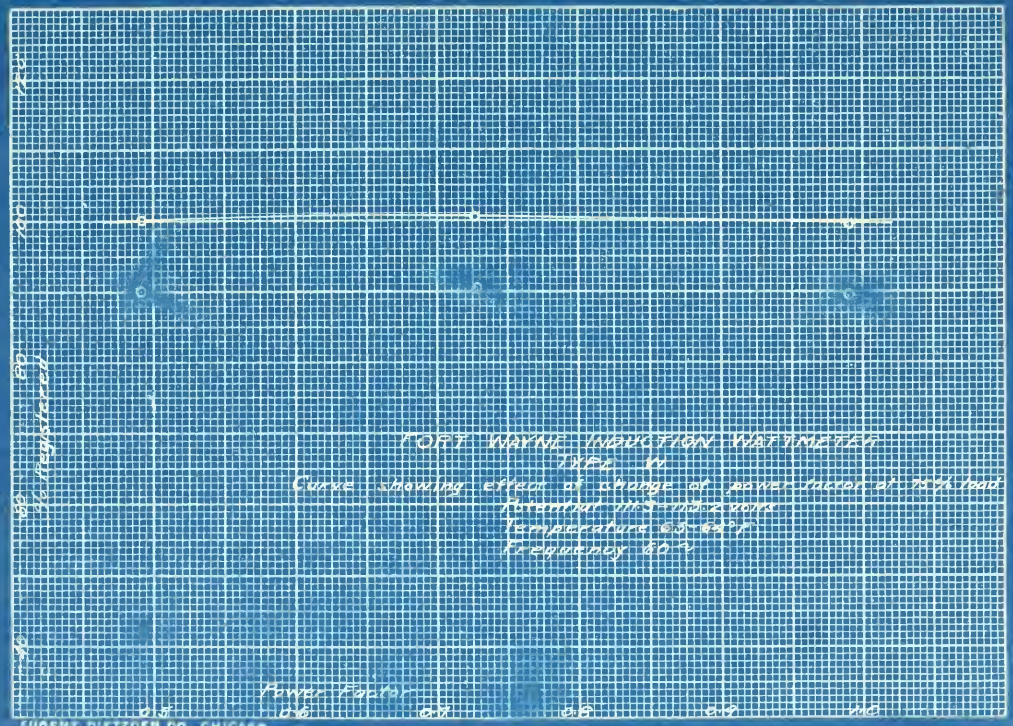
Data showing the effect of change of power factor at 75% load.

Potential = 111.3 - 113.2volts

Temperature = 63-64$_{0}$ ^{o}F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
7.48	.491	100.0
7.48	.727	100.3
7.53	.99	99.5



Curve showing effect of change of power-factor at full load
Barometer 30 inches
Temperature 68° F.
Frequency 60~

EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

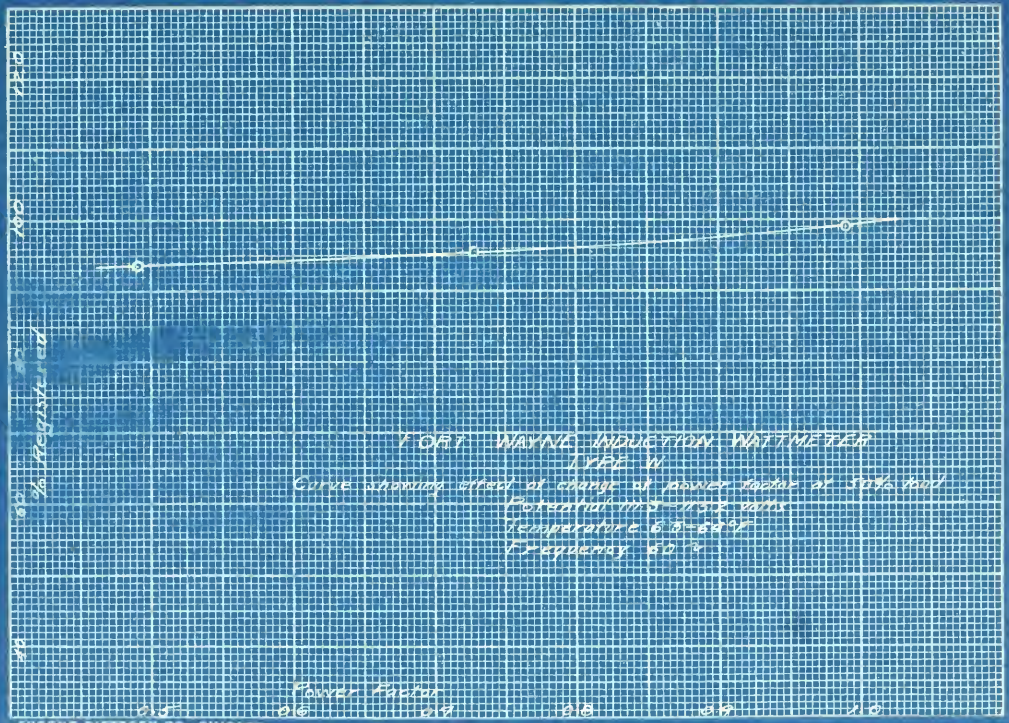
Data showing the effect of change of power factor at 50% load.

Potential = 111.3 -113.2 volts

Temperature = 63 -64°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
5.0	.491	93.4
5.0	.727	95.5
5.0	999	99.0



FORT WAYNE INDUCTION WATTMETER
Type W
Curve showing effect of change of power factor at Std. load
Current 5 amp. Std.
Temperature 68-86°F
Frequency 60 ~

EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

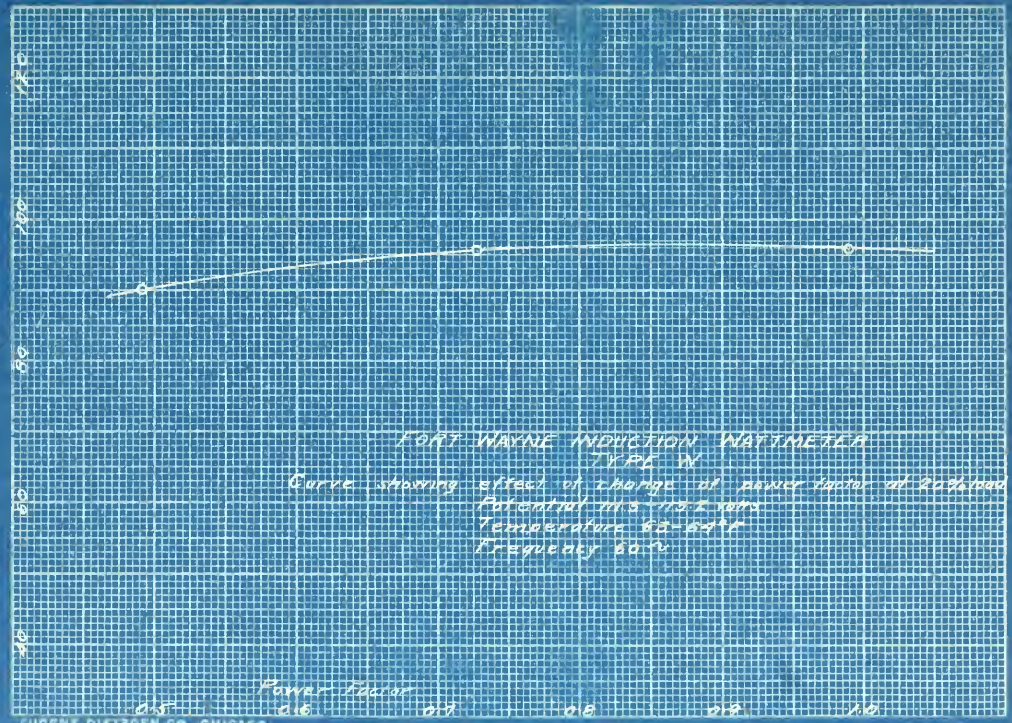
Data showing the effect of change of power factor at 20% load.

Potential = 111.3 -113.2 volts

Temperature = 63 - 64°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
2.02	.491	90.0
2.02	.727	95.5
2.00	.99	.95.9



FORT WAYNE INDUCTION WATTMETER
TYPE W
Curve showing effect of change of power factor on Rotating Potential with constant Temperature 22-24°C
Frequency 60~

EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

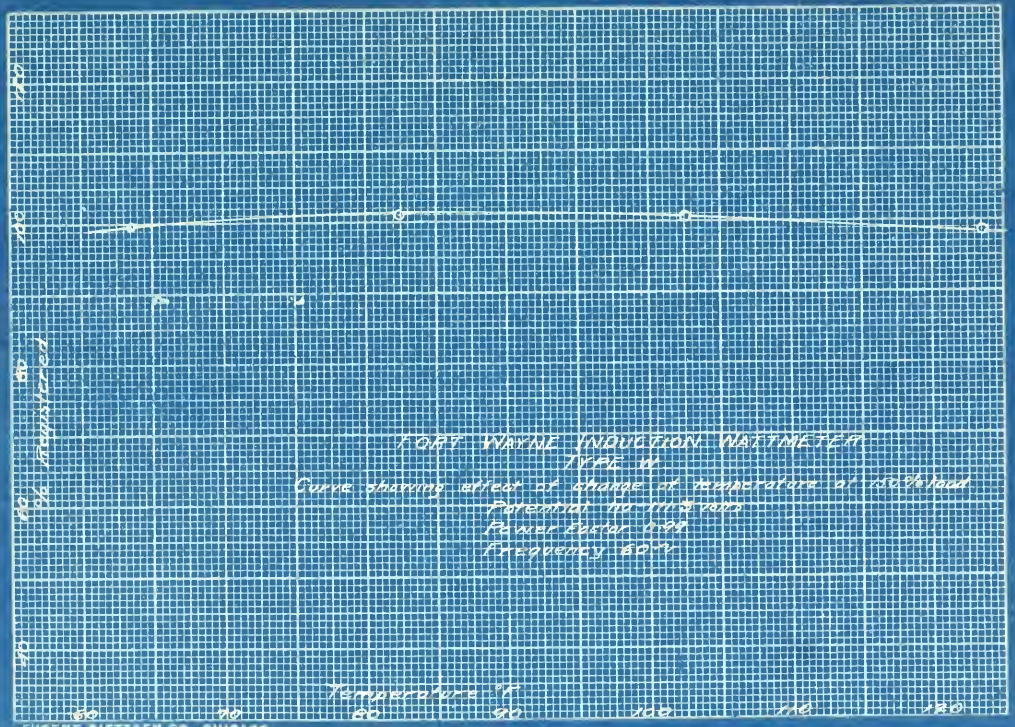
Data showing the effect of change of temperature at 150% load.

Potential = 110.0 - 111.3volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
15.45	63.5	99.5
15.6	82.3	101.0
15.6	102.6	100.5
15.6	123.5	98.5



EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

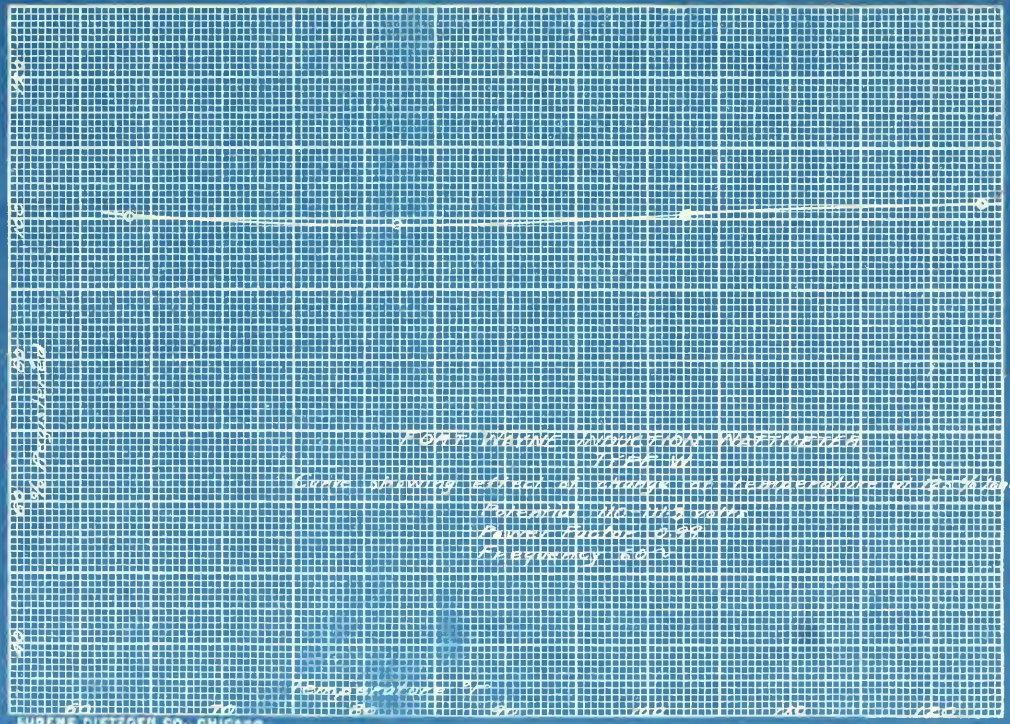
Data showing the effect of change of temperature at 125% load.

Potential = 110.0 - 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
12.8	63.5	100.2
12.9	82.3	99.0
12.9	102.6	100.8
12.7	123.5	102.0


EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

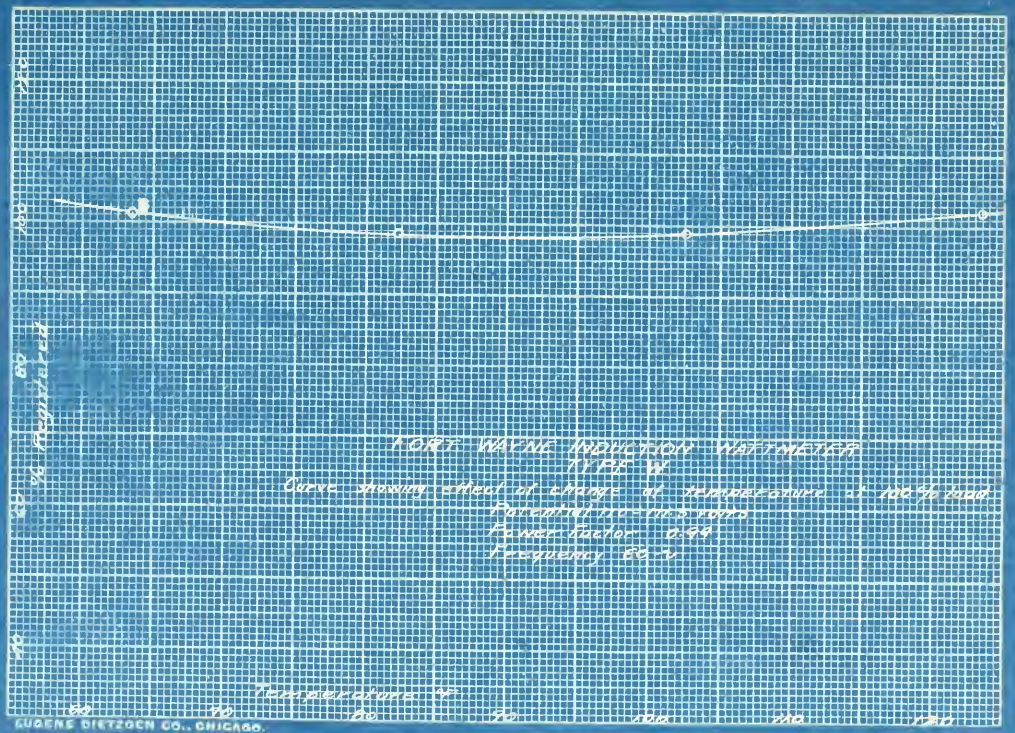
Data showing the effect of change of temperature at 100% load.

Potential = 110.0 - 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
10.2	63.5	101.0
10.3	82.3	98.5
10.3	102.6	99.0
10.3	123.5	102.0



EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmefer Type W.

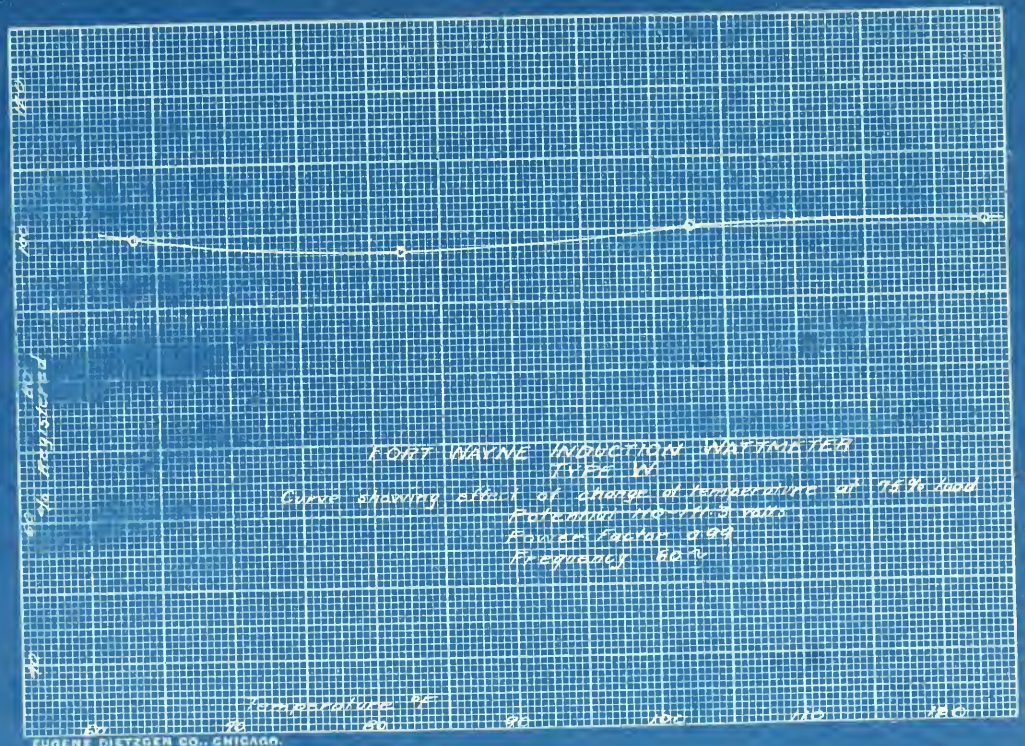
Data showing the effect of change of temperature at 75% load.

Potential = 110.0 - 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
7.53	63.5	99.5
7.50	82.3	97.5
7.50	102.6	100.2
7.50	123.5	100.2


FORT WAYNE INDUCTION WATTMETER
TYPE W
Curve showing effect of change of temperature at 75% load
Percentage Fast or Slow
Power Factor 1.00
Frequency 60 ~
Temperature of
EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

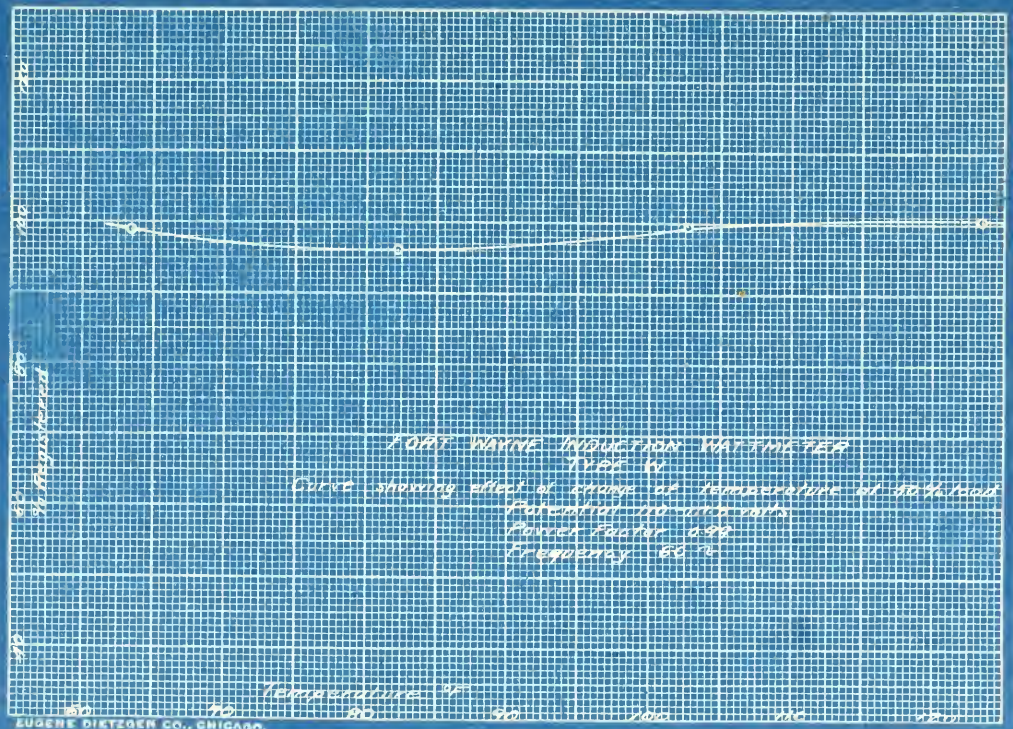
Data showing the effect of change of temperature at 50% load.

Potential = 110.0 - 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
5.0	63.5	99.0
5.25	82.3	96.0
5.25	102.3	99.8
5.25	123.5	100.3


Post Marine Inspection Waterproof
Type W
Color winding effect of canvas or fabric on hard
Cotton duck 10 oz per sq yd
Canvas Fabric 6 oz
Frequency 60 ~
Temperature 70°
EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type W.

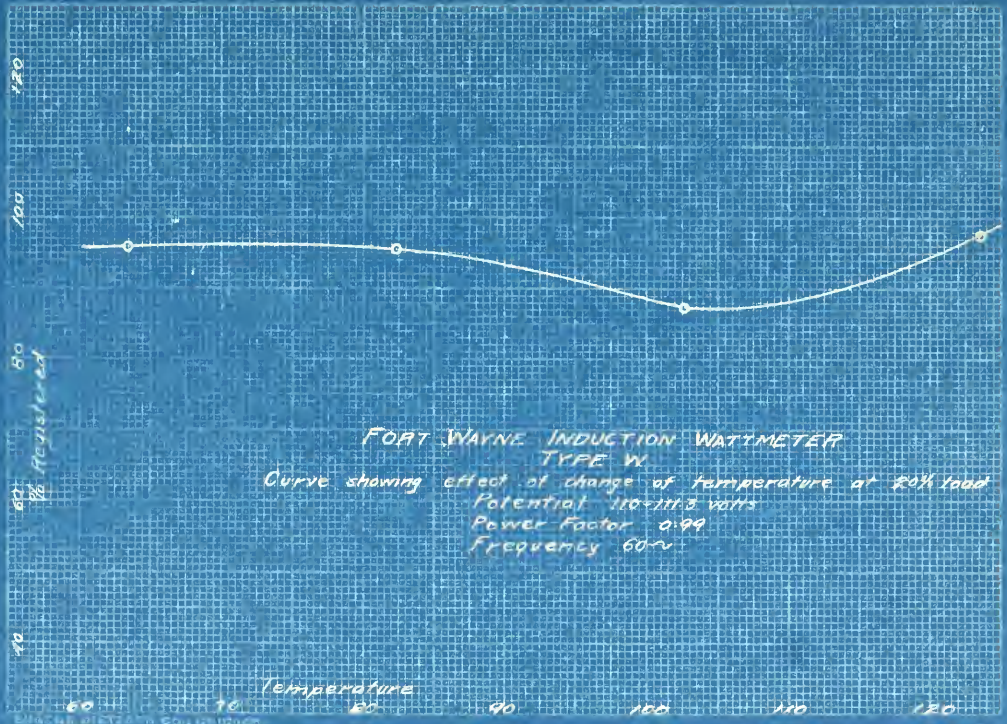
Data showing the effect of change of temperature at 20% load.

Potential = 110.0 - 111.5 volts

Power factor = .99

Frequency = 60 cycles/sec,

Current	Temperature	% Registered
2.0	63.5	95.9
2.0	82.3	95.5
2.0	102.6	87.3
2.0	123.5	97.6


120
100
80
60
40
% Registered
FORT WAYNE INDUCTION WATTMETER
TYPE W
Curve showing effect of change of temperature at 50% load
Potential 110-115 volts
Power Factor 0.99
Frequency 60~
Temperature
60
70
80
90
100
110
120

Fort Wayne Induction Wattmeter Type W.

Shunt Loss = 1.9 watts at 110 volts and 60 cycles/sec.

Series Loss = 6.5 " " 10 amperes and 60 cycles/sec.

Determination of Flux Quadrature

Amperes	Volts	Watts	Cos θ	θ
9.42	104.4	5.0	.00503	89° 42' 33"

DUNCAN

INDUCTION WATTMETER

TYPE A

NO C 2902

KILOWATT HOURS
SIEMENS & HALSKE ELECTRIC COMPANY OF AMERICA
CHICAGO, ILL. NO. 5, U.S.A.

Duncan Induction Wattmeter Type A.

Data showing the effect of change of load at normal voltage and frequency, and unity power factor.

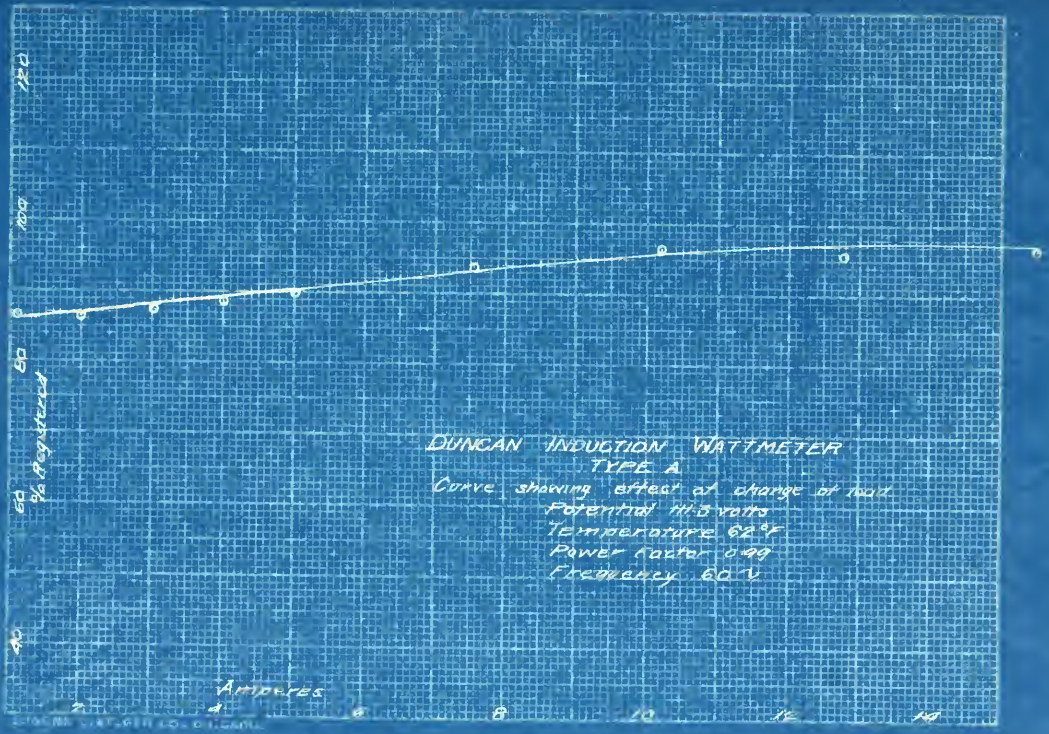
Potential = 111.3 volts

Temperature = 62°F,

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.45	141.8	137	96.6
12.8	117.0	112	95.8
10.2	92.2	89	96.5
7.53	69.4	65	93.7
5.0	46.7	42	90.0
4.0	37.2	33	88.7
3.03	28.6	25	87.4
2.0	18.5	16	86.5
1.09	9.25	8	86.5



DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of load
Potential 115 volts
Temperature 62° F
Power factor 0.99
Frequency 60 ~

Duncan Induction Wattmeter Type A.

Data showing the effect of change of load at normal frequency, unity power factor, and 75% normal voltage.

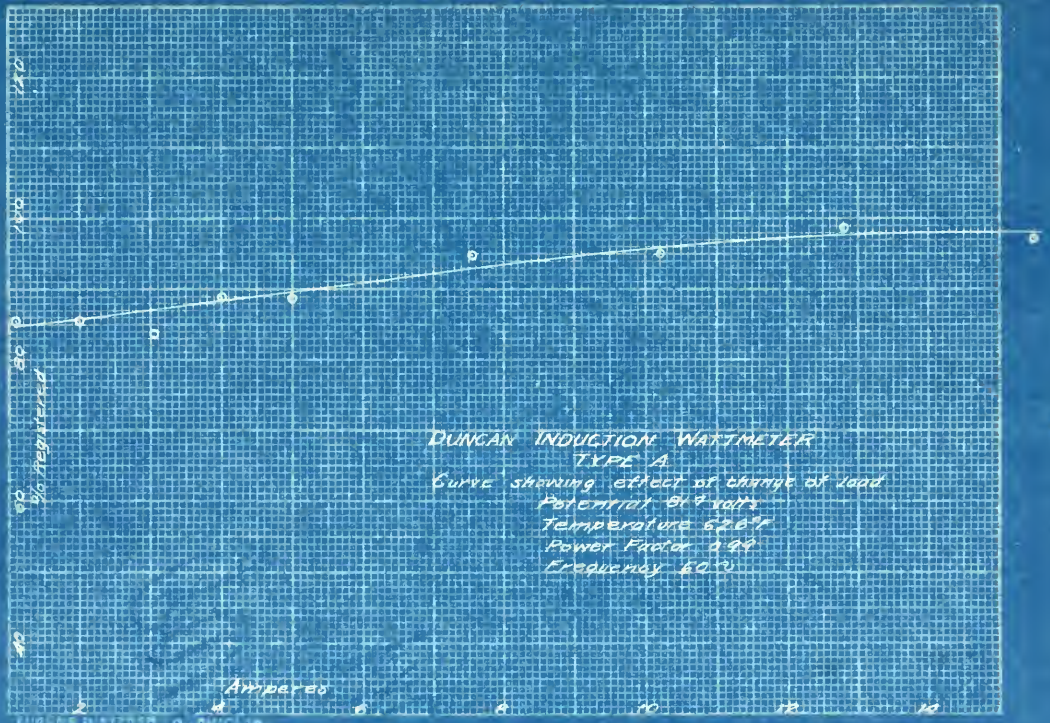
Potential = 81.7 volts

Temperature = 62.6°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.45	104.9	102	97.3
12.8	86.1	85	98.8
10.2	69. 3	66	95.1
7.53	50.6	48	94.9
5.0	36.0	32	88.9
4.0	28.1	25	88.9
3.03	21.6	18	83.3
2.02	14.04	12	85.4
1.09	7.01	6	85.5


% Registered
Amperes
DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of load
Potential 60 volts
Temperature 62.6°F
Power Factor 0.99
Frequency 60 ~

Duncan Induction Wattmeter Type A.

Data showing the effect of change of load at normal frequency, unity power factor, and 90% normal voltage.

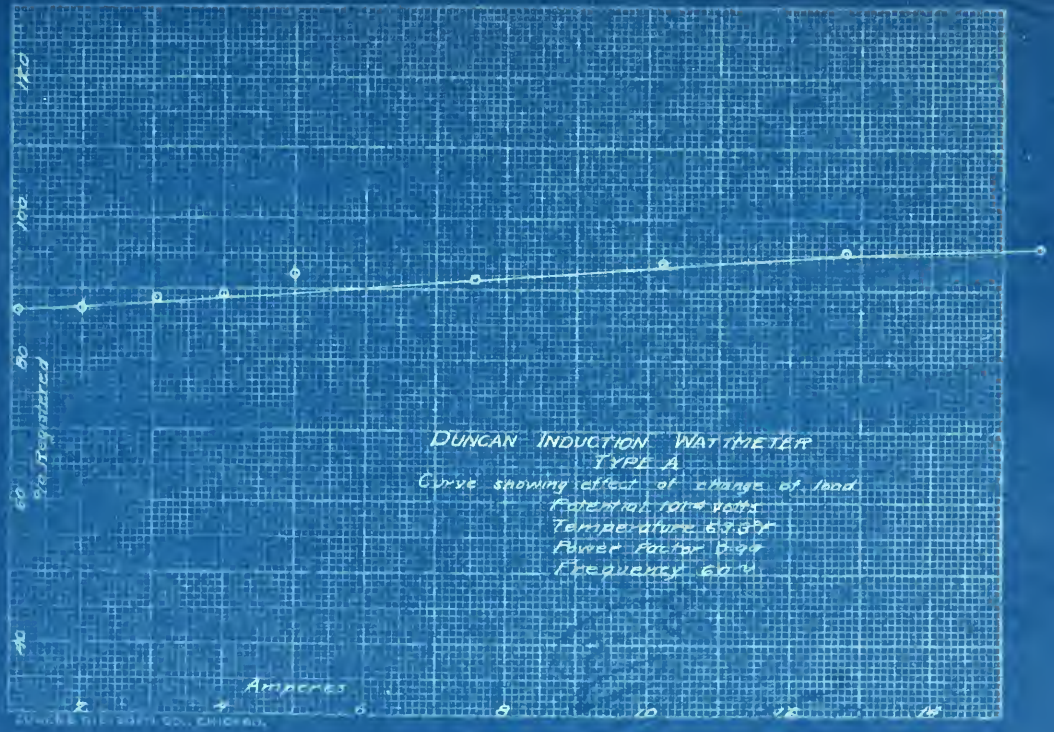
Potential = 101.4 volts

Temperature = 63.3°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.45	128.3	123	95.8
12.8	106.1	101	95.2
10.2	86.4	81	93.9
7.53	63.3	58	91.6
5.0	43.5	40	92.0
4.0	34.8	31	89.0
3.03	27.0	24	88.9
2.0	17.2	15	87.2
1.09	8.05	7	86.9


Percentage
Amperes
0
2
4
6
8
10
12
14
DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of load
Potential 120 volts
Temperature 67 deg F
Power Factor 0.99
Frequency 60 ~

Duncan Induction Wattmeter Type A.

Data showing the effect of change of load at normal frequency, unity power factor, and110% normal voltage.

Potential = 121.0 volts

Temperature = 62.12°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	157.6	150	95.2
12.85	129.7	123	95.0
10.16	101.6	95	93.5
7.48	75.4	70	92.8
5.0	50.4	46	91.3
4.03	41.05	37	90.0
3.01	31.37	27	89.3
2.02	20.15	18	89.3
1.08	8.92	8	89.6

Not Registered
Registered
Number of Voters
Registration Statistics
Registered Voters
Not Registered
Registration Statistics
Number of Voters

Duncan Induction Wattmeter Type A.

Data showing the effect of change of load at normal voltage, unity power factor, and 66% normal frequency.

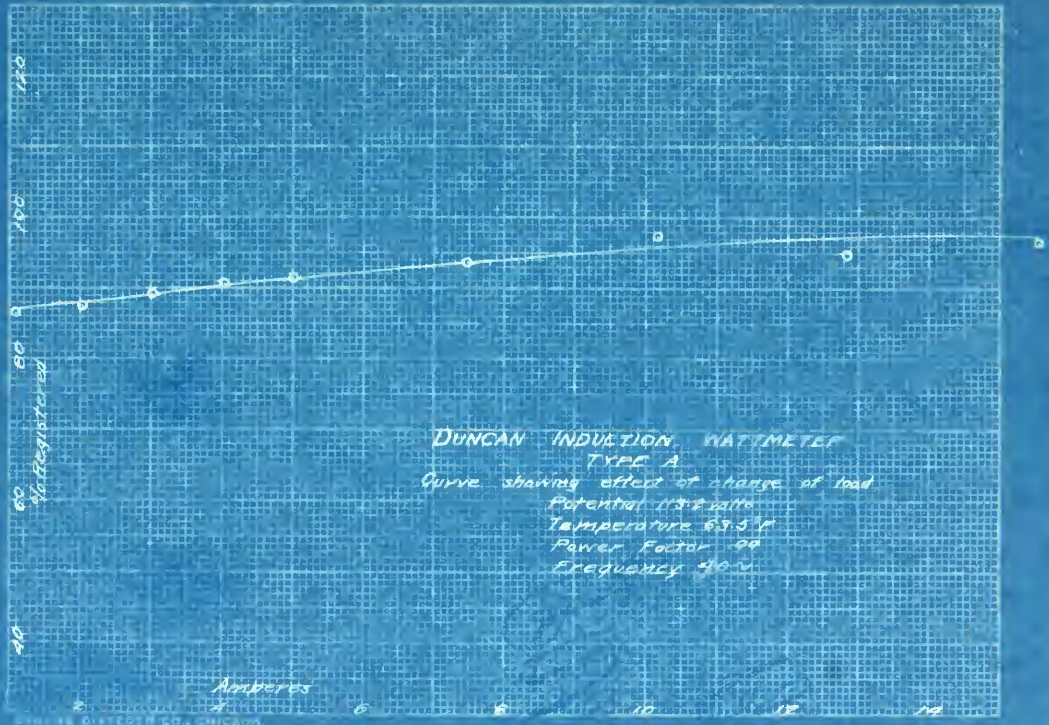
Potential = 113.2 volts

Temperature = 63.5°F.

Power factor = .99

Frequency = 40 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	143.0	138	96.5
12.85	117.0	111	95.0
10.16	92.5	90.0	97.4
7.48	69.3	65	93.8
5.0	48.2	44	91.3
4.03	37.6	34	90.5
3.01	28.1	25	89.0
2.02	18.25	16	87.7
1.08	8.1	7	96.5


% Registration
Amperes
DUNCAN INDUCTION WATTMETER
Type A
Curve showing effect of change of load
Potential 115 volts
Temperature 69.5 F
Power Factor .99
Frequency 60 ~

Duncan Induction Wattmeter Type A.

Data showing the effect of change of load at normal voltage, unity power factor, and 133% normal frequency.

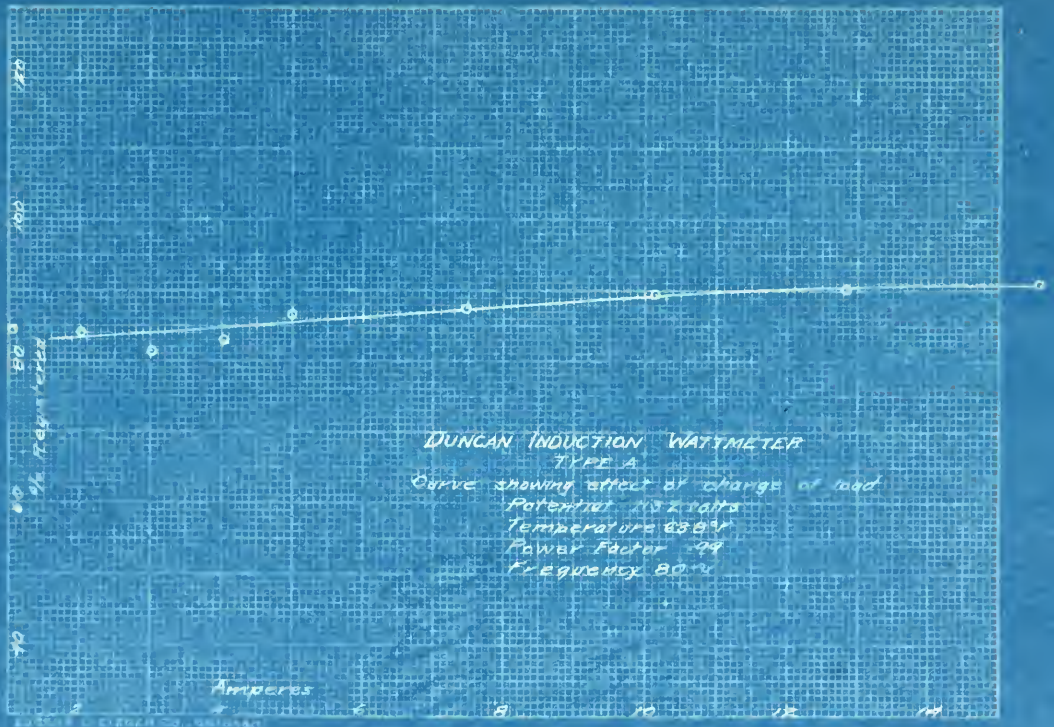
Potential = 113.2 volts

Temperature = 63.8°F.

Power factor = .99

Frequency = 80 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	143.0	130	90.9
12.85	118.6	107	90.3
10.16	93.7	84	89.6
7.48	70.7	62	87.6
5.0	46.4	40	86.3
4.03	37.4	31	82.9
3.01	28.3	23	81.3
2.02	19.0	16	84.2
1.08	9.46	8	84.5



DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of load
Potential 115 volts
Temperature 83°F
Power Factor .99
Frequency 80~

Duncan Induction Wattmeter Type A.

Data showing the effect of change of load at normal voltage and frequency, and 75% power factor.

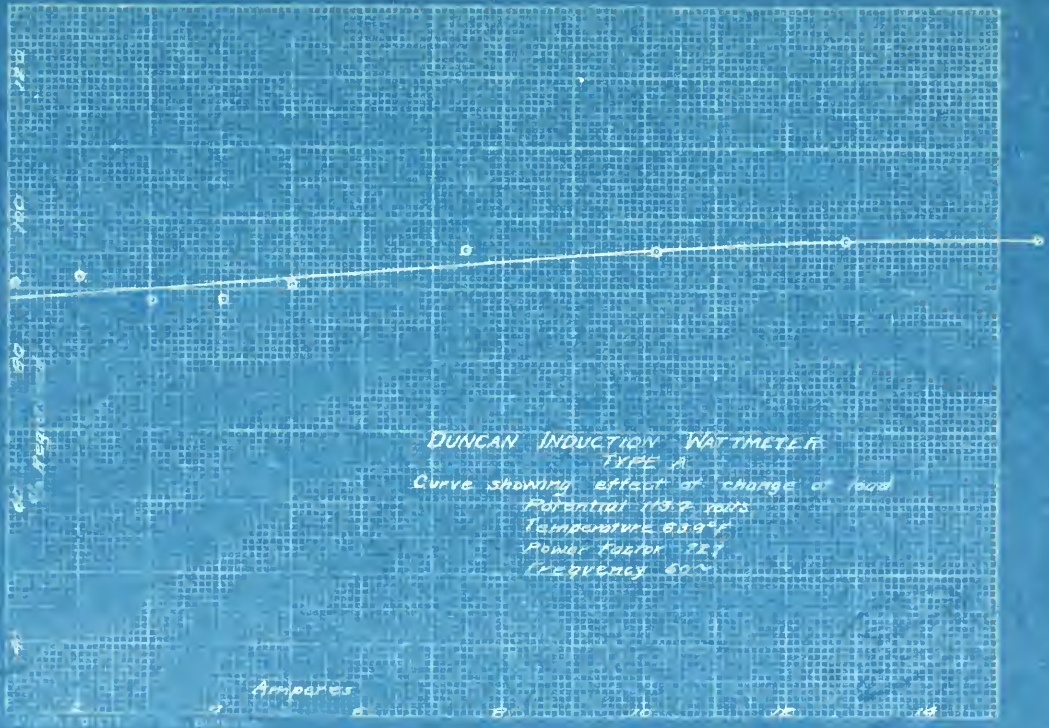
Potential = 113.2 volts

Temperature = 63.9°F.

Power factor = .727

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	102.0	99	97.0
12.85	83.5	81	97.0
10.16	69.0	66	95.5
7.48	51.1	49	95.7
5.0	35.4	32	90.4
4.03	28.2	25	88.7
3.01	22.6	20	88.5
2.02	14.5	13	91.9
1.08	7.7	7	90.9



DUNCAN INDUCTION WATTMETER.
TYPE A
Curve showing effect of change of load
Potential 115 volts
Temperature 65.9° F.
Power Factor 1.0
Frequency 60 ~

Duncan Induction Wattmeter Type A.

Data showing the effect of change of load at normal voltage and frequency, and 50% power factor.

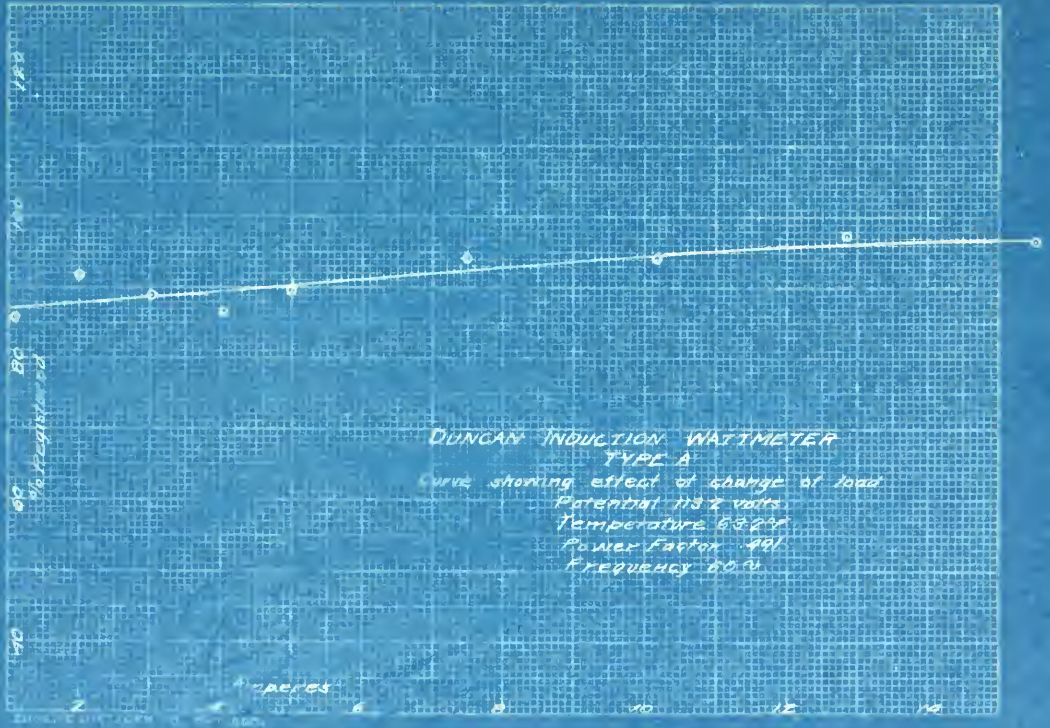
Potential = 113.2 volts

Temperature = 63.2°F.

Power factor = .491

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	68.5	66	96.5
12.85	58.5	57	97.5
10.16	46.8	44	94.0
7.48	56.3	53	94.1
5.0	23.4	21	89.7
4.03	18.5	16	86.5
3.01	14.6	13	89.0
2.02	9.8	9	91.9
1.08	4.66	4	85.9


% Registration
Amperes
DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of load
Potential 115 volts
Temperature 68.2°F.
Power factor 99%
Frequency 60 ~

Duncan Induction Wattmeter Type A.

Data showing the effect of change of load at normal voltage and frequency, and unity power factor.

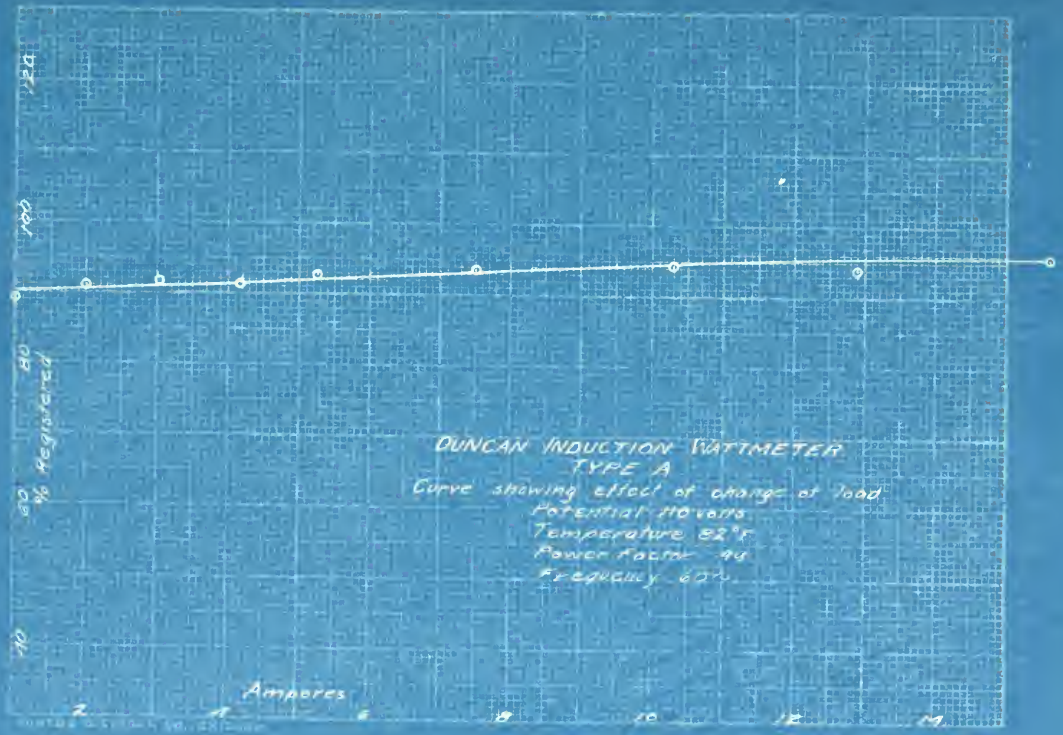
Potential = 110.0 volts

Temperature = 82°F.

Power factor =.99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	138.0	132	95.6
12.9	116.0	109	94.0
10.3	91.3	86	94.2
7.5	67.3	63	93.6
5.25	45.3	42	92.7
4.18	36.0	33	91.6
3.02	27.25	25	91.8
2.0	17.6	16	91.0
0.98	10.1	9	89.1



DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of load
Potential 110 volts
Temperature 82° F.
Power Factor 94
Frequency 60 ~.

Duncan Induction Wattmeter Type A.

Data showing the effect of change of load at normal voltage and frequency, and unity power factor.

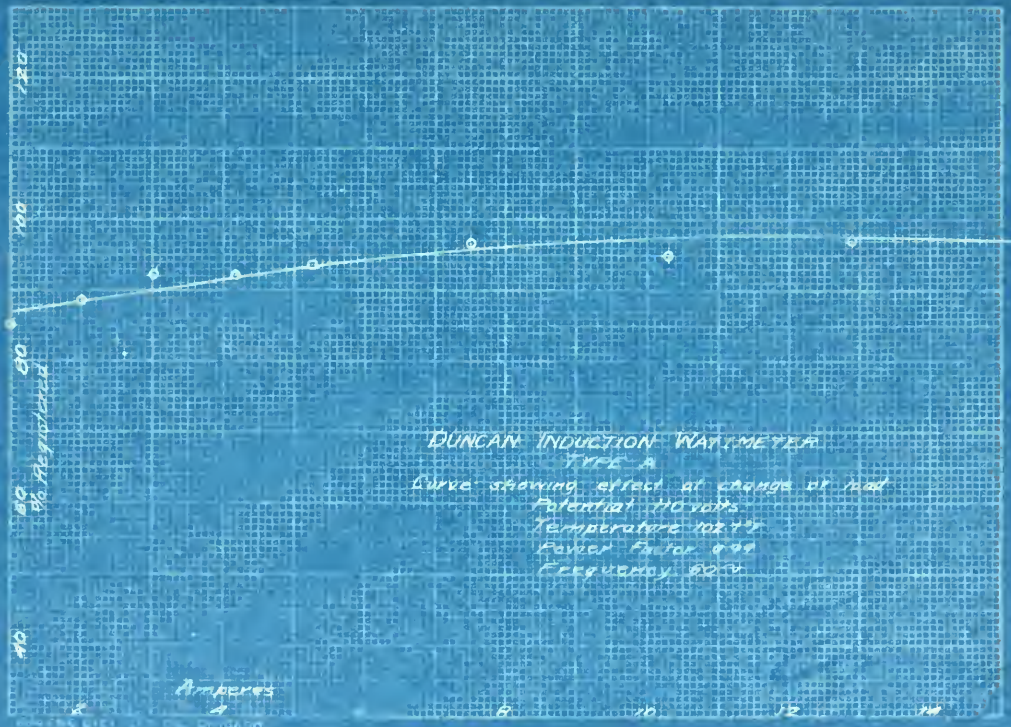
Potential = 110.0 volts

Temperature = 102.7°F.

Power factor =.99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	139.0	135	97.0
12.9	116.3	113	97.0
10.3	90.8	86	94.9
7.5	67.2	65	96.6
5.25	44.8	42	93.7
4.18	35.8	33	92.2
3.02	27.1	25	92.2
2.0	16.9	15	88.7
0.98	8.24	7	85.0



DUNCAN INDUCTION WATTMETER
Type A
Curve showing effect of change of load
Potential 110 volts
Temperature 102 F°
Power Fac. for 0.99
Frequency 60 ~

Duncan Induction Wattmeter Type A.

Data showing the effect of change of load at normal voltage and frequency, and unity power factor.

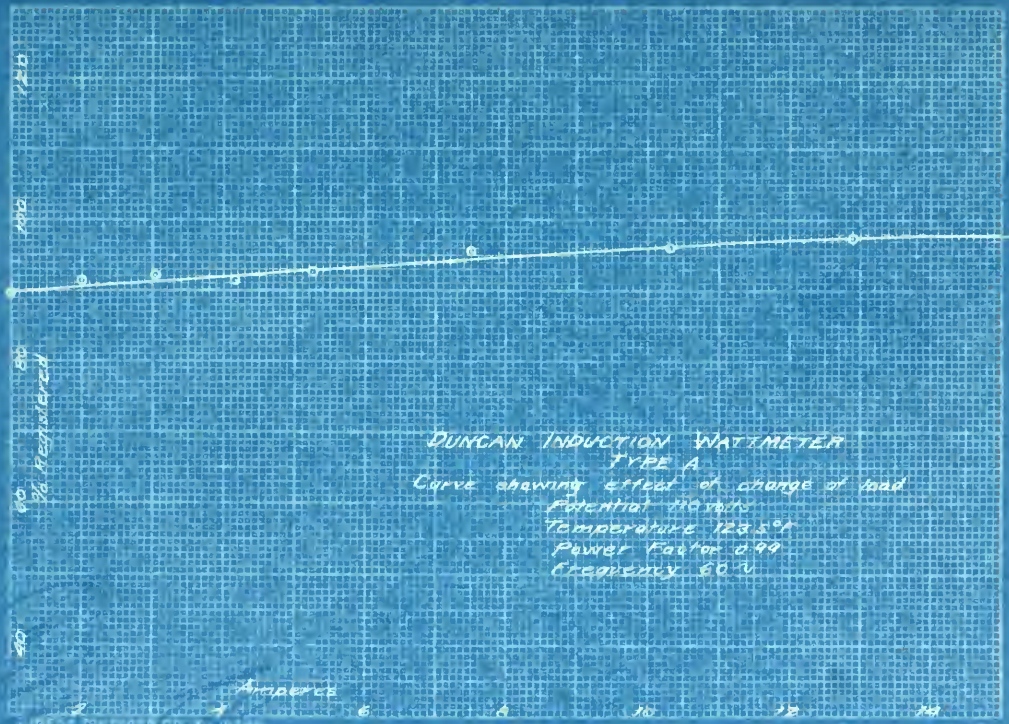
Potential = 110.0 volts

Temperature = 123.5°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	140.1	137	97.6
12.9	116.0	113	97.4
10.3	89.6	86	96.0
7.5	69.1	66	95.5
5.25	45.3	42	92.7
4.18	36.2	33	91.3
3.02	27.2	25	92.0
2.0	18.6	17	91.3
0.98	8.94	8	89.6



DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of load
Fractional Scale
Temperature 123.5°F
Power Factor 0.99
Frequency 60~

Duncan Induction Wattmeter Type A.

Data showing the effect of change of voltage at 150% load.

Temperature = 62 -63.3°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
15.45	81.7	97.3
15.45	101.4	96.8
15.45	111.3	96.6
15.45	121.0	95.2

DUNCAN INDUCTION WATTMETER
Type A-14
Curve showing effect of changes in frequency
Power factor 1.0
Frequency 60 cycles
40
60
80
100
120
% Registered
Load
25
50
75
100
125

Duncan Induction Wattmeter Type A.

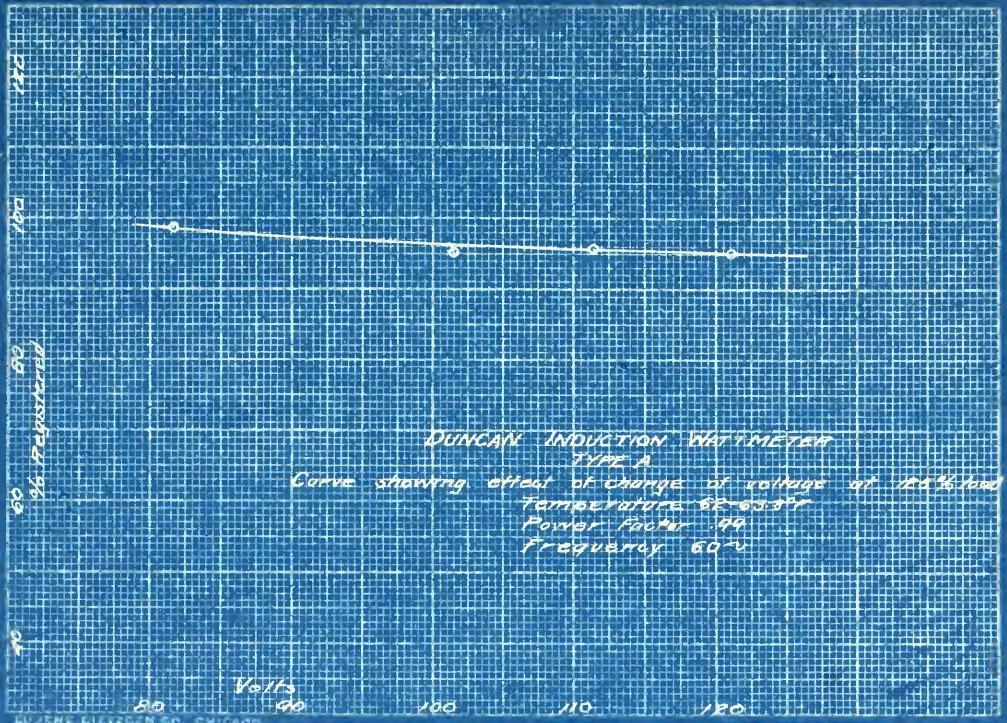
Data showing the effect of change of voltage at 125% load.

Temperature = 62 - 63.3°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
12.8	81.7	98.8
12.8	101.4	95.2
12.8	111.3	95.8
12.85	121.0	95.0



DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of voltage at full load
Temperature 68-69.5°F
Power Factor 1.0
Frequency 60~

EUGENE DIETZGEN CO., CHICAGO.

Duncan Induction Wattmeter Type A.

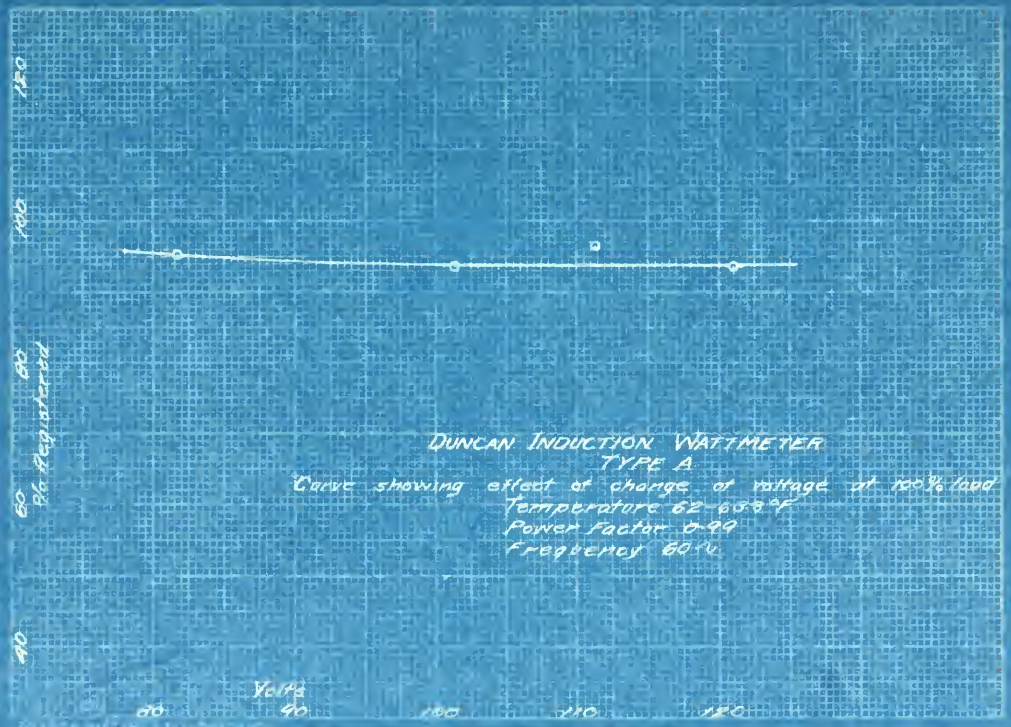
Data showing the effect of change of voltage at 100% load.

Temperature = 62 - 63.5°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
10.2	81.7	95.1
10.2	101.4	93.9
10.2	111.3	96.5
10.16	121.0	93.5



DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of voltage at 100% load
Temperature 62-80.8°F
Power Factor 0.99
Frequency 60.0

Duncan Induction Wattmeter Type A.

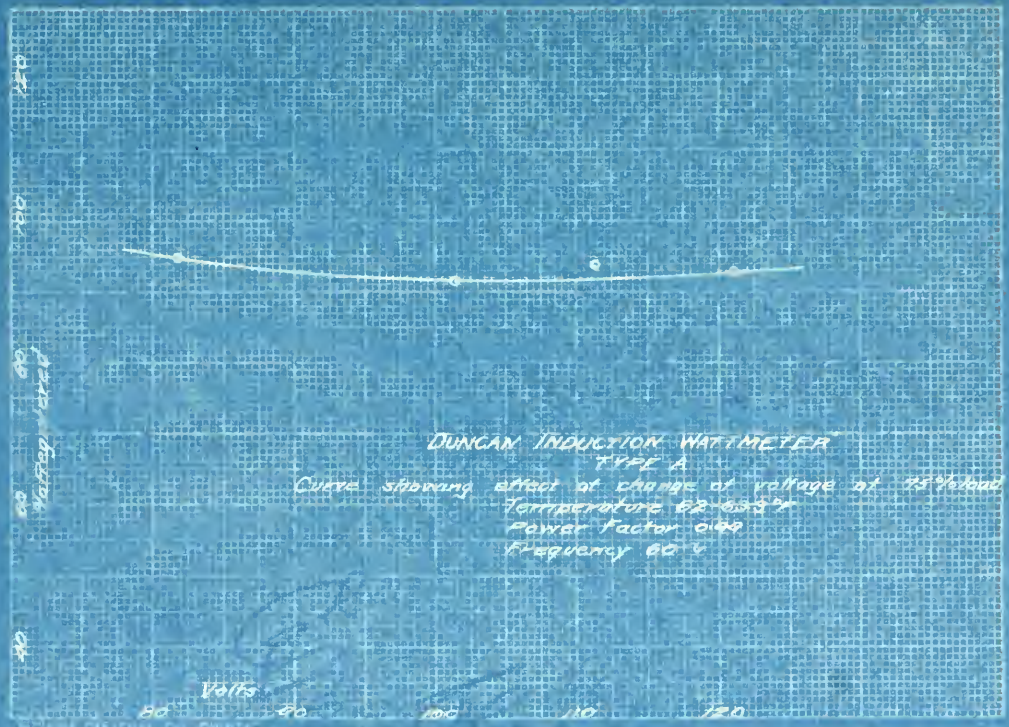
Data showing the effect of change of voltage at 75% load.

Temperature = 62 - 63.3°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
7.53	81.7	94.9
7.53	101.4	91.6
7.53	111.3	93.7
7.48	121.0	92.8



DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of voltage at 75% load
Temperature 82-83°F
Power Factor 0·99
Frequency 60 ~

Duncan Induction Wattmeter Type A.

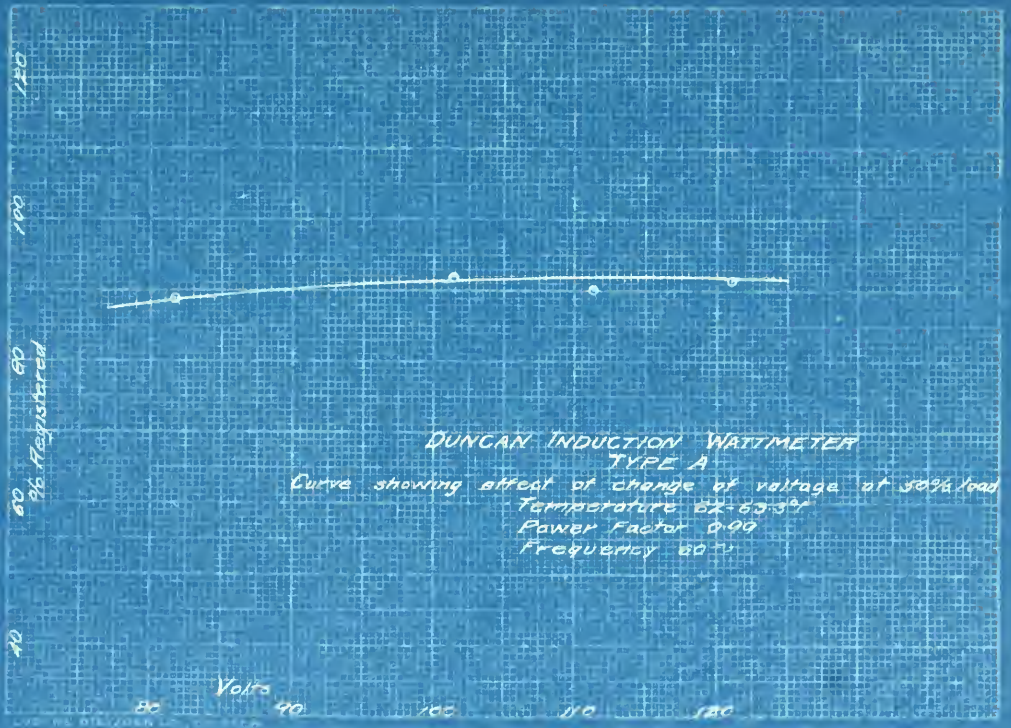
Data showing the effect of change of voltage at 50% load.

Temperature = 62 - 63.3°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
5.0	81.7	88.9
5.0	101.4	92.0
5.0	111.3	90.0
5.0	121.0	91.3



DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of voltage at 50% load
Temperature 62-63°F
Power Factor 0.00
Frequency 60 ~

Duncan Induction Wattmeter Type A.

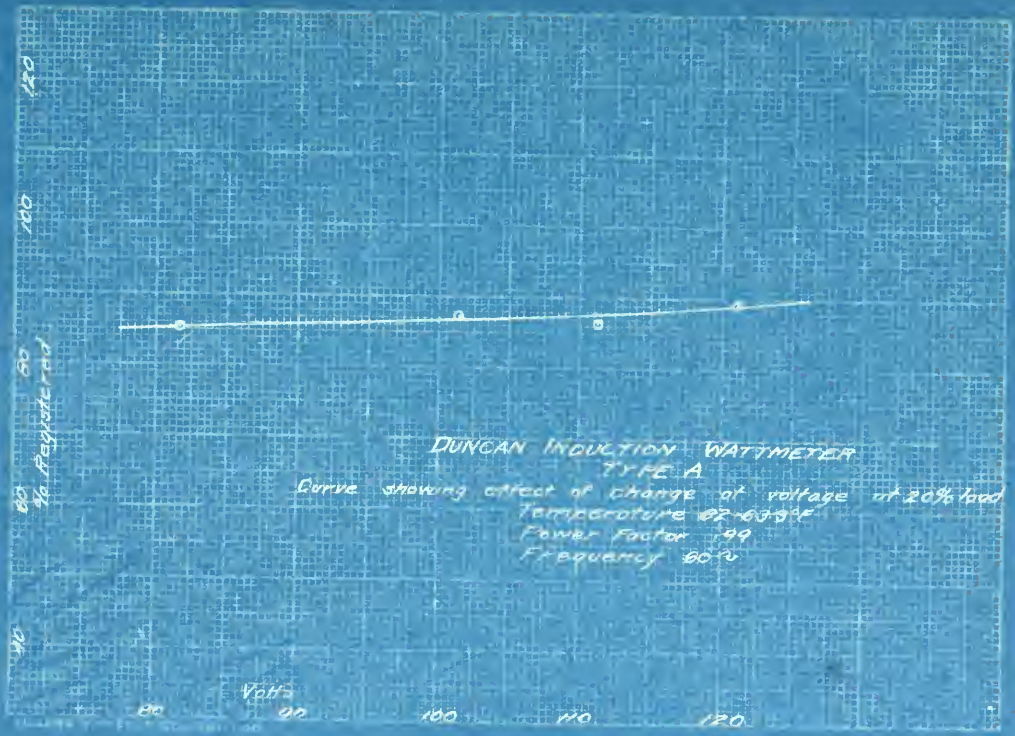
Data showing the effect of change of voltage at 20% load.

Temperature = 62 - 63.3°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
2.0	81.7	85.4
2.0	101.4	87.2
2.0	111.3	86.5
2.02	121.0	89.3



DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of voltage at 20% load
Temperature 82-83°F
Power Factor 99
Frequency 60~

Duncan Induction Wattmeter Type A.

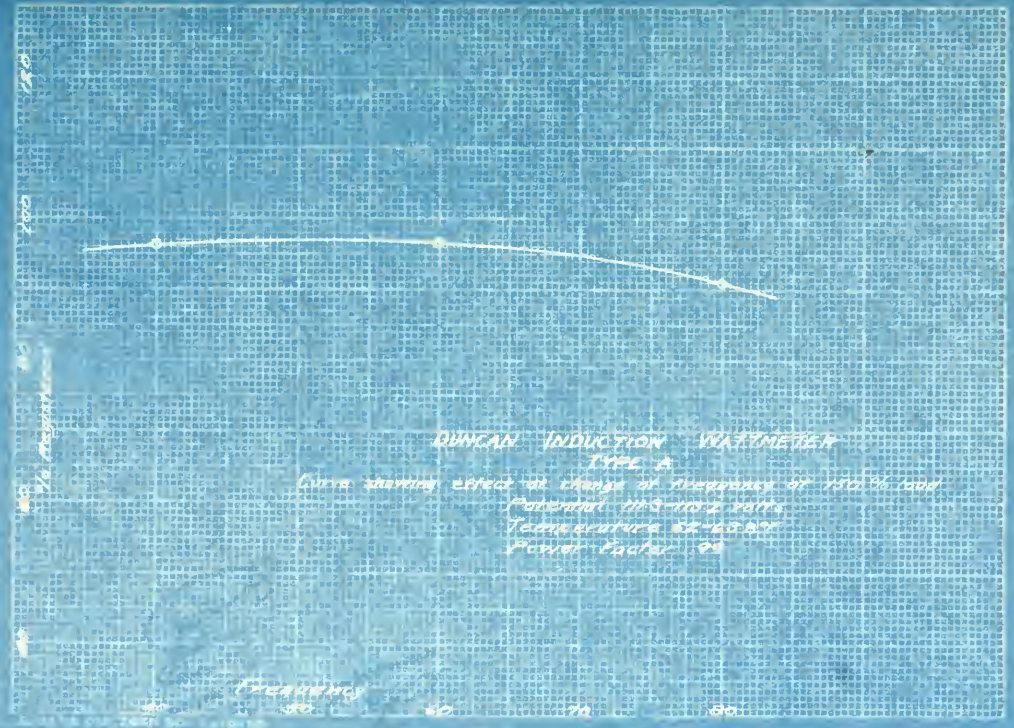
Data showing the effect of change of frequency at 150% load.

Potential = 111.3 - 113.2 volts

Temperature = 62 - 63.8°F.

Power factor = .99

Current	Frequency	% Registered
15.53	40	96.5
15.45	60	96.6
15.53	80	90.9


DUNCAN INDUCTION WATTMETER
TYPE A

Duncan Induction Wattmeter Type A.

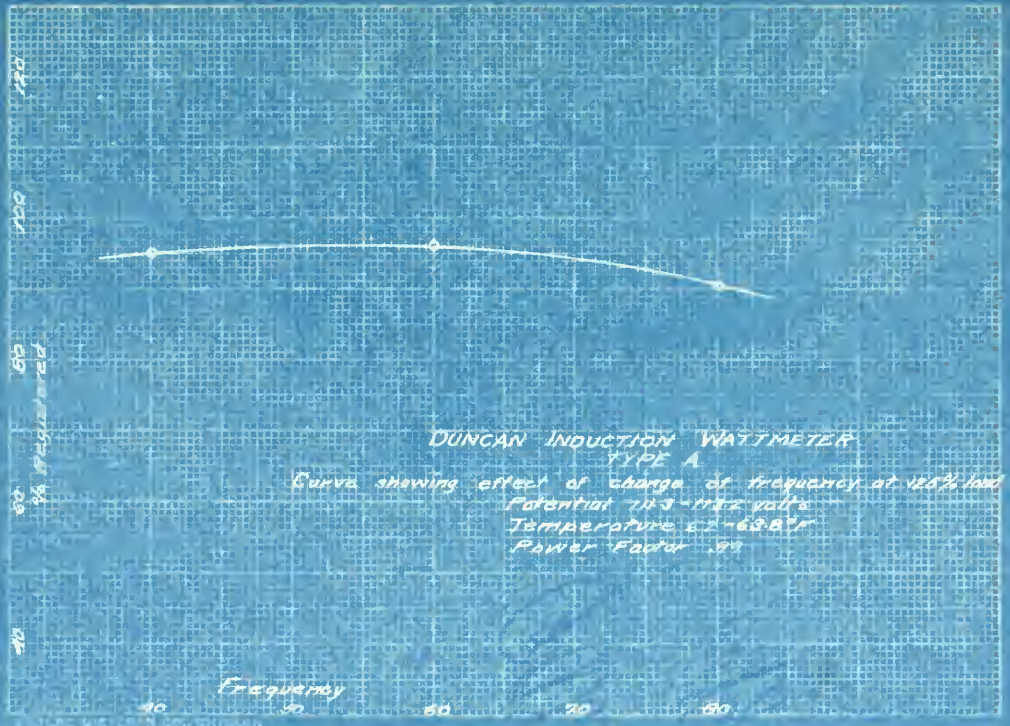
Data showing the effect of change of frequency at 125% load.

Potential = 111.3 -113.2 volts

Temperature = 62 -63.8°F.

Power factor = .99

Current	FRequency	% Registered
12.85	40	95.0
12.8	60	95.8
12.85	80	90.3


DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of frequency at 125% load
Potential 110-cycle volts
Temperature 23-63.5°F
Power Factor .99
% Registration
120
100
80
60
40
Frequency
40
50
60
70
80

Duncan Induction Wattmeter Type A.

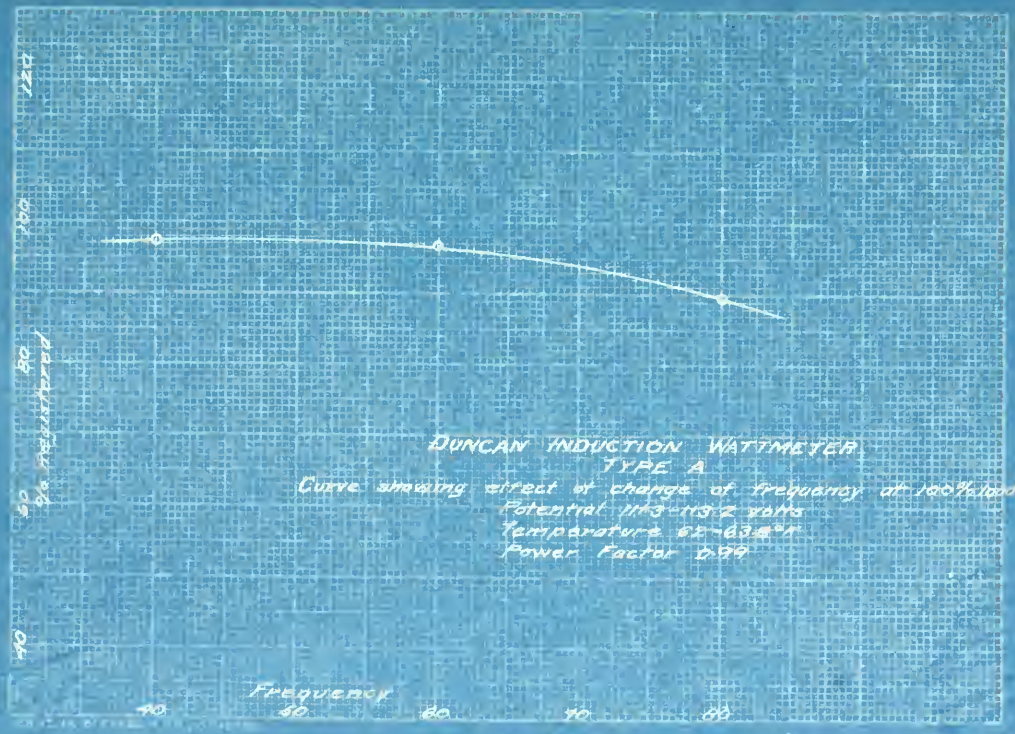
Data showing the effect of change of frequency at 100% load.

Potential = 111.3 - 113.2 volts

Temperature = 62 - 63.8°F.

Power factor = .99

Current	Frequency	% Registered
10.16	40	97.4
10.2	60	96.5
10.16	80	89.6



DUNCAN INDUCTION WATTMETER.
TYPE A
Curve showing effect of change of frequency at 100% load
Potential 111·3 113·2 volts
Temperature 61·4°F
Power Factor 0·99

Duncan Induction Wattmeter Type A.

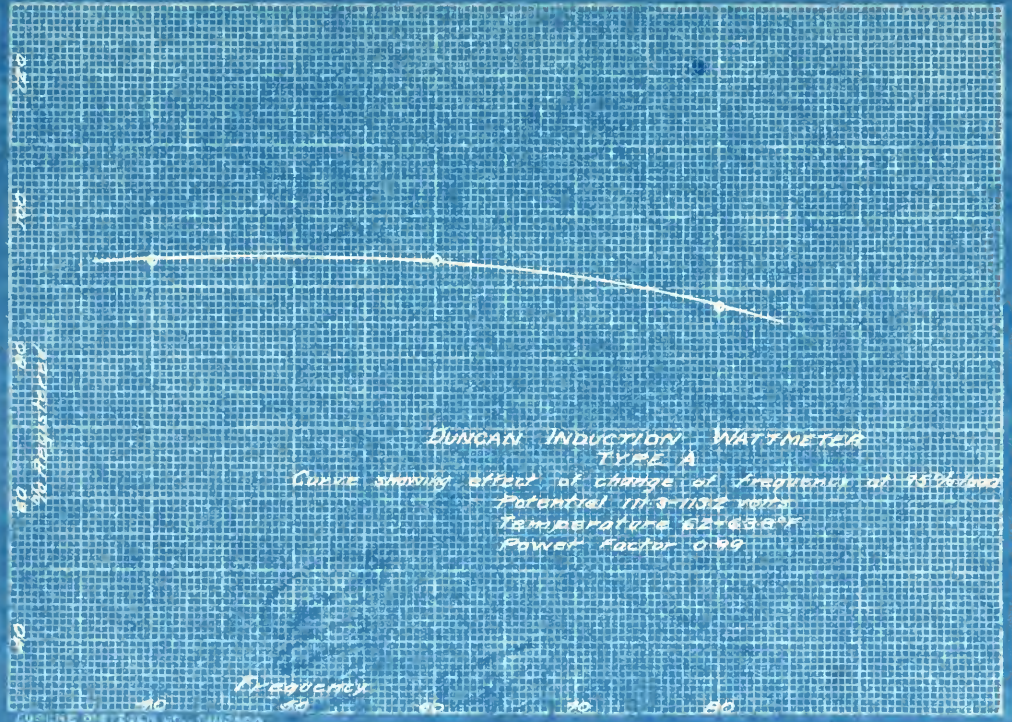
Data showing the effect of change of frequency at 75% load.

Potential = 111.3 - 113.2 volts

Temperature = 62 - 63.8°F.

Power factor = .99

Current	Frequency	% Registered
7.48	40	93.8
7.53	60	93.7
7.48	80	87.6


DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of frequency at 95% load
Potential 111.3-113.2 volts
Temperature 62°-63.6°F
Power Factor 0.99
Per cent Error
Frequency
40
50
60
70
80

Duncan Induction Wattmeter Type A.

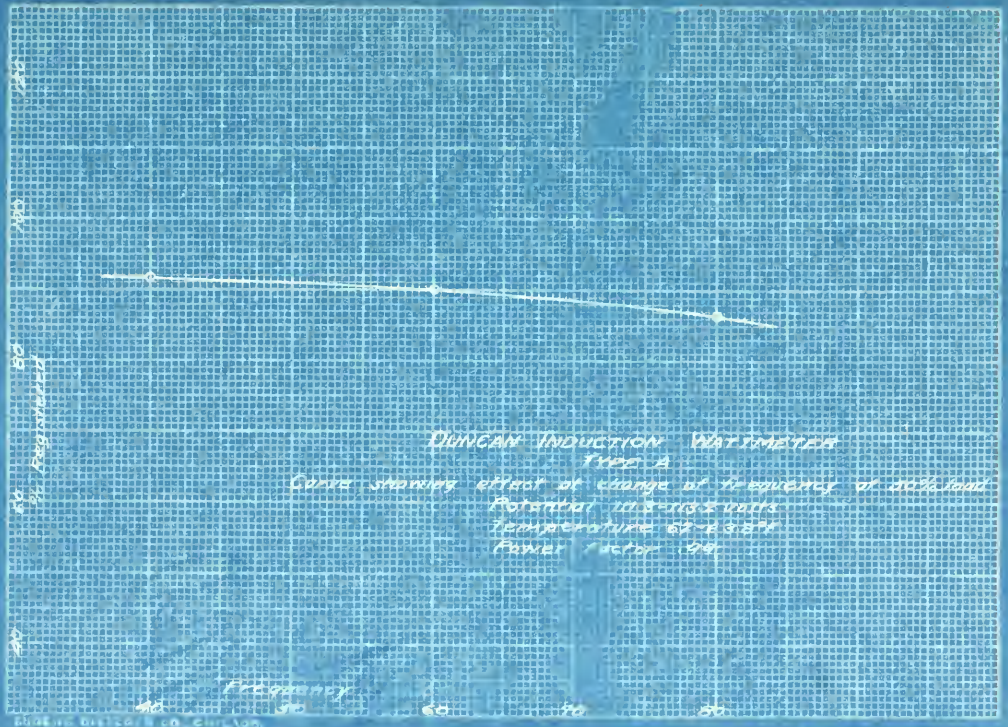
Data showing the effect of change of frequency at 50% load.

Potential = 111.3 - 113.2 volts

Temperature = 62 - 63.8°F.

Power factor = .99

Current	Frequency	% Registered
5.0	40	91.3
5.0	60	90.0
5.0	80	86.3


DUNCAN INDUCTION WATTMETER
Type A
Curve showing effect of change of frequency at constant
Potential and current
Temperature 60° C
Power Factor 100
Frequency
Percentage Error

Duncan Induction Wattmeter Type A.

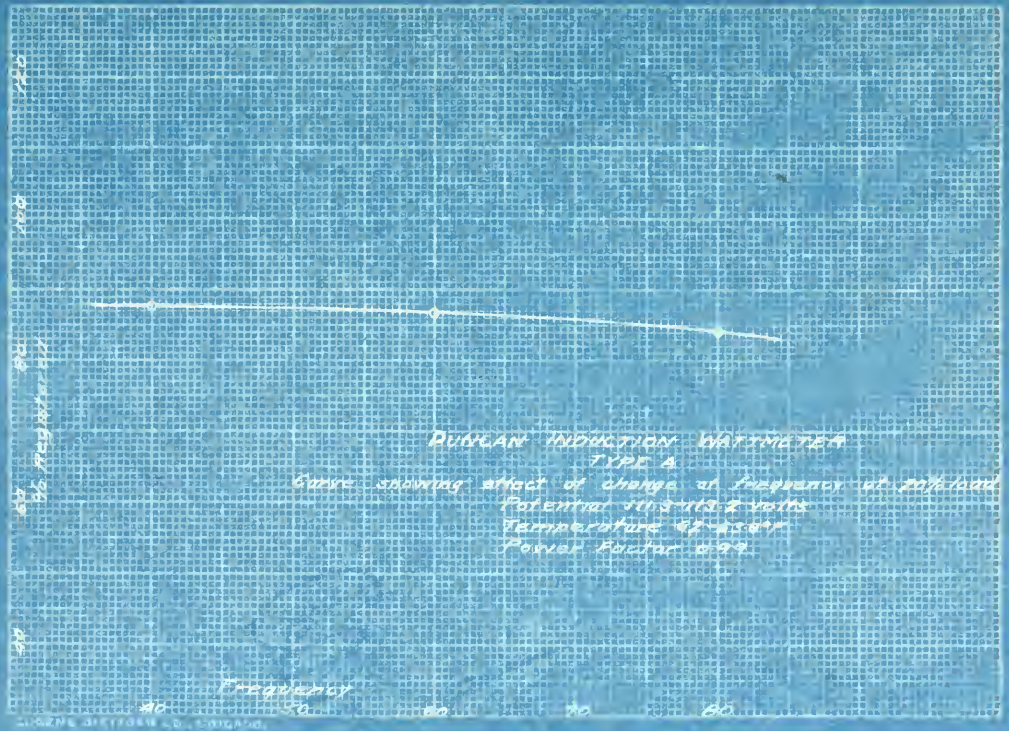
Data showing the effect of change of frequency at 20% load.

Potential = 111.3 - 113.2 volts

Temperature = 62 - 63.8°F.

Power factor = .99

Current	Frequency	% Registered
2.02	40	87.7
2.00	60	86.5
2.02	80	84.2


DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of frequency at 50% load
Potential 115-120 Volts
Temperature 77° Fahr.
Power Factor 0.99
Frequency
40
50
60

Duncan Induction Wattmeter Type A.

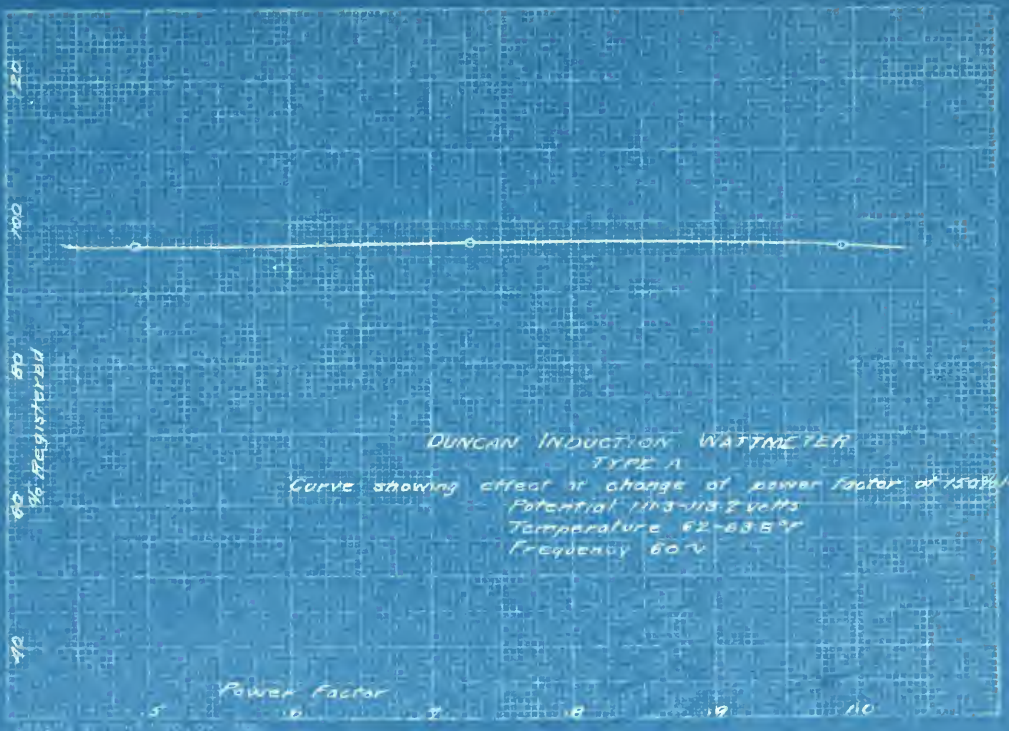
Data showing the effect of change of power factor at 150% load.

Potential = 111.3 -113.2 volts

Temperature = 62 - 63.9

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
15.53	.491	96.5
15.53	.727	97.0
15.45	.99	96.6



DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of power factor at 150% load
Potential 111.3-113.2 volts
Temperature 62-63.5°F
Frequency 60 ~

Duncan Induction Wattmeter Type A.

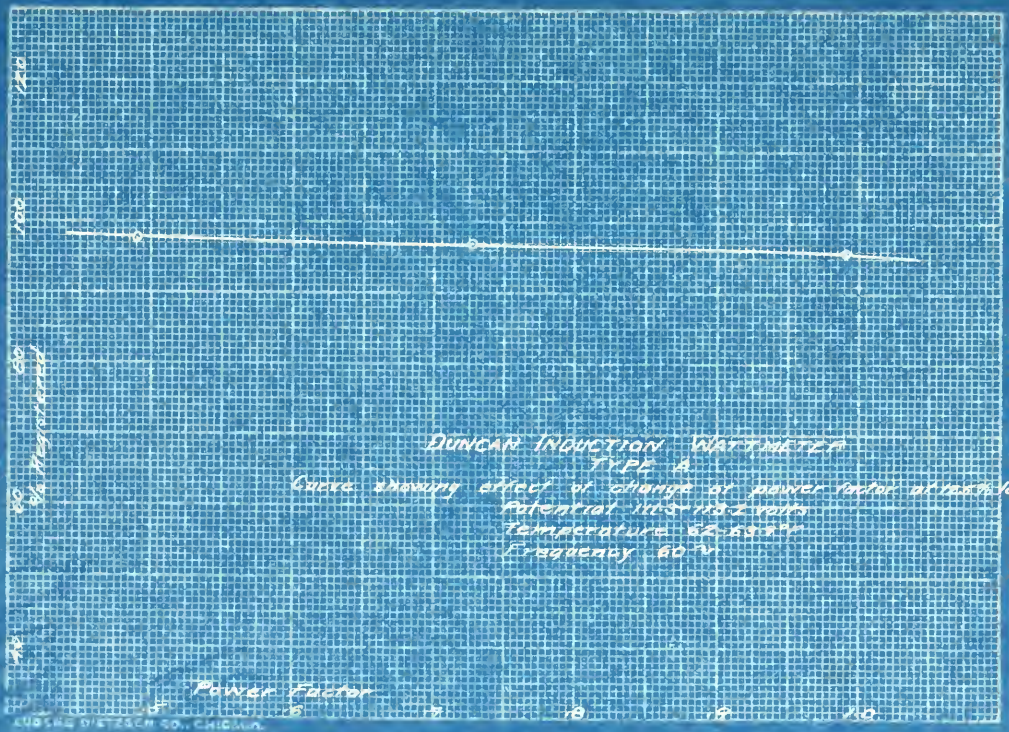
Data showing the effect of change of power factor at 125% load.

Potential = 111.3 - 113.2 volts

Temperature = 62 - 63.9°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
12.85	.491	97.5
12.85	.727	97.0
12.8	.99	95.8


DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of power factor at rated load
Potential 110-115-120 volts
Temperature 25 deg. C.
Frequency 60 ~
Power Factor
.5
.9
1.0
AUGUST DIETZGEN CO., CHICAGO.

Duncan Induction Wattmeter Type A.

Data showing the effect of change of power factor at 100% load.

Potential = 111.3 -113.2 volts

Temperature = 62 - 63.9°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
10.16	.491	94.0
10.16	.727	95.5
10.2	.99	96.5

DUNCAN INDUCTION WATTMETER
TYPE A

Curve showing effect of change of power factor at load
Potential coil 110-120 volts
Temperature 24°-68°F
Frequency 60 ~

Duncan Induction Wattmeter Type A.

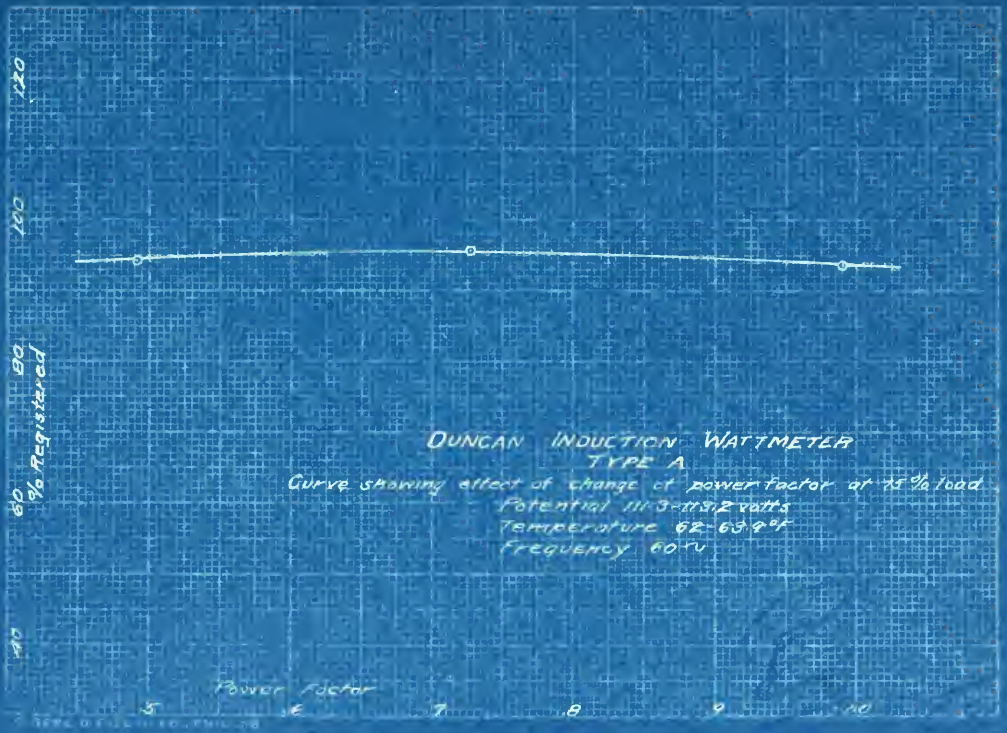
Data showing the effect of change of power factor at 75% load.

Potential = 111.3 - 113.2 volts

Temperature = 62 - 63.9°F,

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
7.48	.491	94.1
7.48	.727	95.7
7.53	.99	93.7



DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of power factor at 75% load
Potential 111.3-111.2 volts
Temperature 62-63.9°F
Frequency 60~

Duncan Induction Wattmeter Type A.

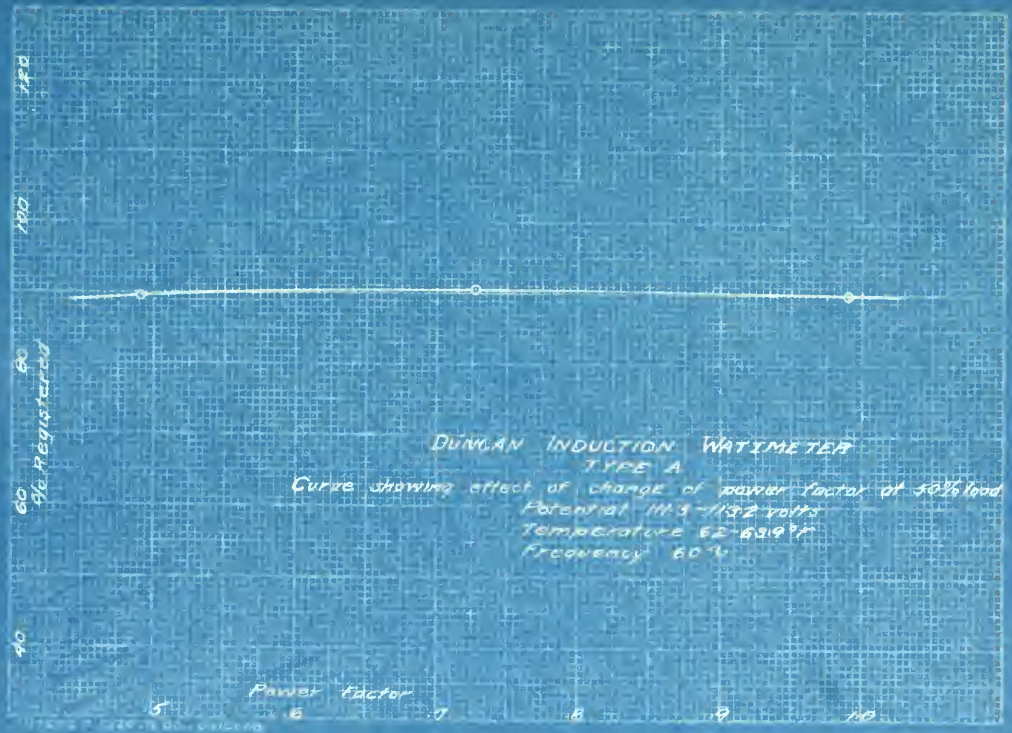
Data showing th e effect of change of power factor at 50% load.

Potential = 111.3 - 113.2 volts

Temperature = 62 - 63.9°F.

Frequency =60 cycles/sec.

Current	Power factor	% Registered
5.0	.491	89.7
5.0	.727	90.4
5.0	.99	90.0



DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of power factor at 50% load
Potential 111.3-113.2 volts
Temperature 62°-63.9°F
Frequency 60 ~

Duncan Induction Wattmeter Type A.

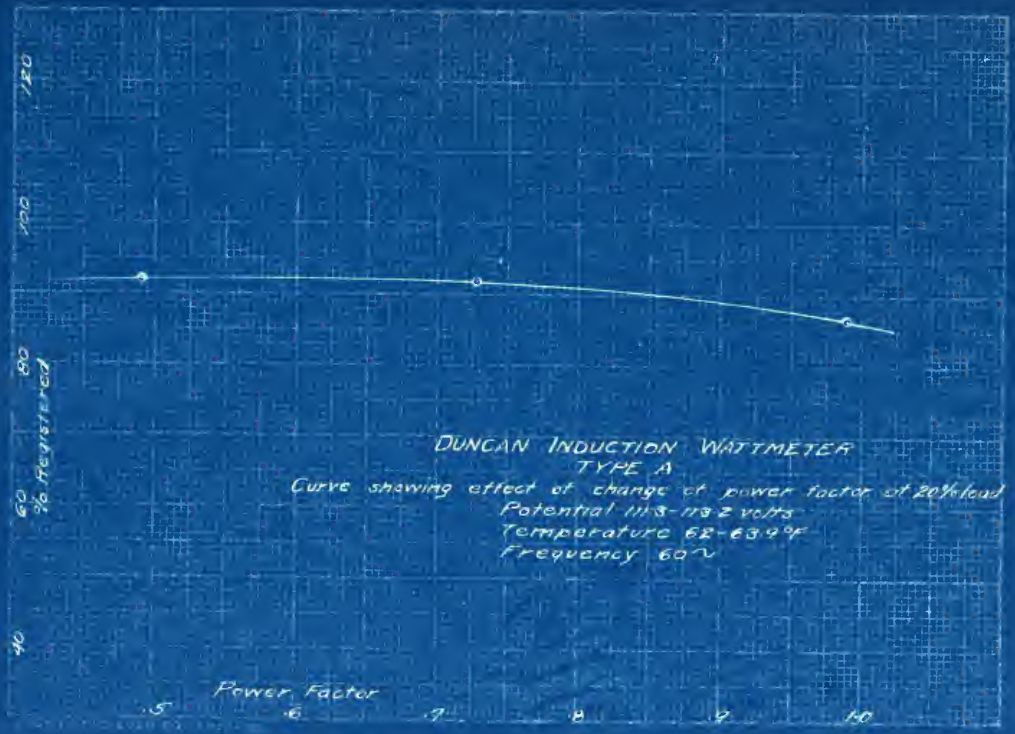
Data showing the effect of change of power factor at 20% load.

Potential = 111.3 - 113.2 volts

Temperature = 62 - 63.9°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
2.02	.491	91.9
2.02	.727	91.9
2.00	.99	86.5



DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of power factor at 20% load
Potential 111.3-113.2 volts
Temperature 62-63.9°F
Frequency 60 ~

Duncan Induction Wattmeter Type A.

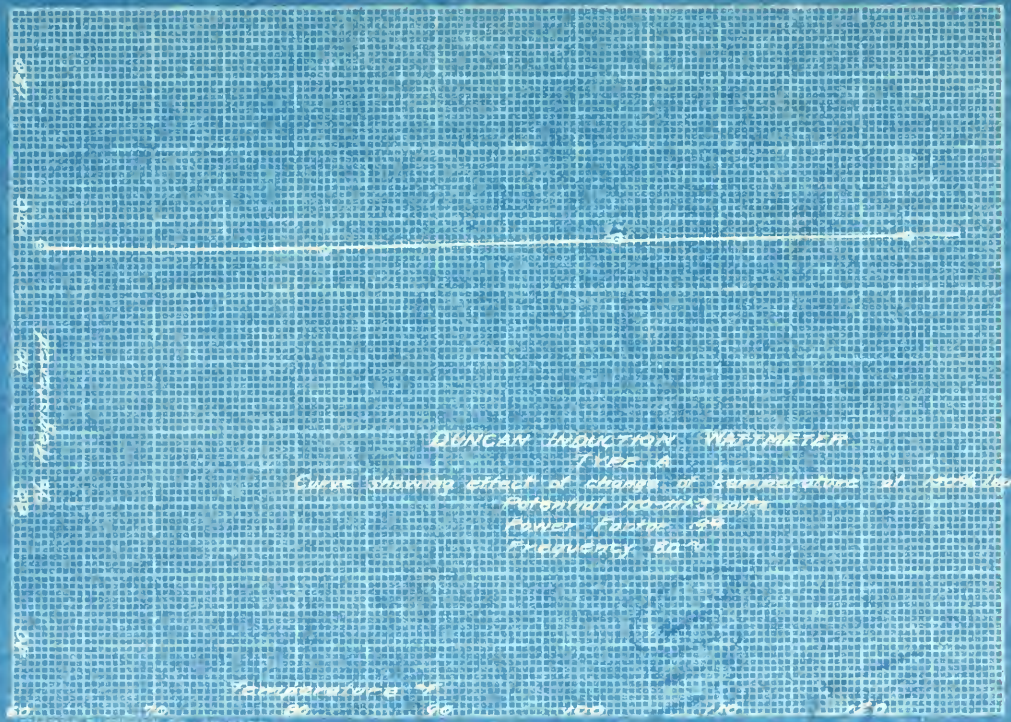
Data showing the effect of change of temperature at 150% load.

Potential = 110 - 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
15.45	62	96.6
15.6	82	95.6
15.6	102.7	97.0
15.6	123.5	97.6


DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of temperature of enclosed
Potential coil on 3 volts
Power Factor 1.0
Frequency 60~
Temperature °F
50
60
70
80
90
100
110

Duncan Induction Wattmeter Type A.

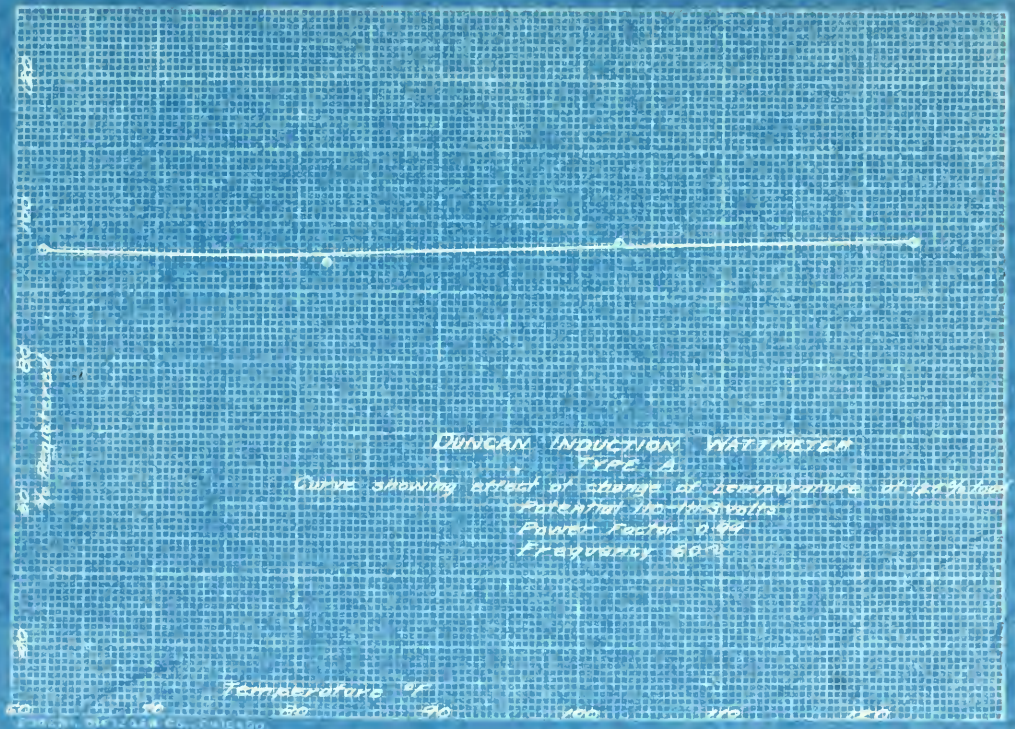
Data showing the effect of change of temperature at 125% load.

Potential = 110 - 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
12.8	62	95.8
12.9	82	94.0
12.9	102.7	97.0
12.9	123.5	97.4


DUNCAN INDUCTION WATTMETER
Type A
Curve showing effect of change of temperature of electrical
Potential 100 Volts
Power Factor 0.00
Frequency 60 ~
Per Cent Error
Temperature °F
50
60
70
80
90
100
110
120

Duncan Induction Wattmeter Type A.

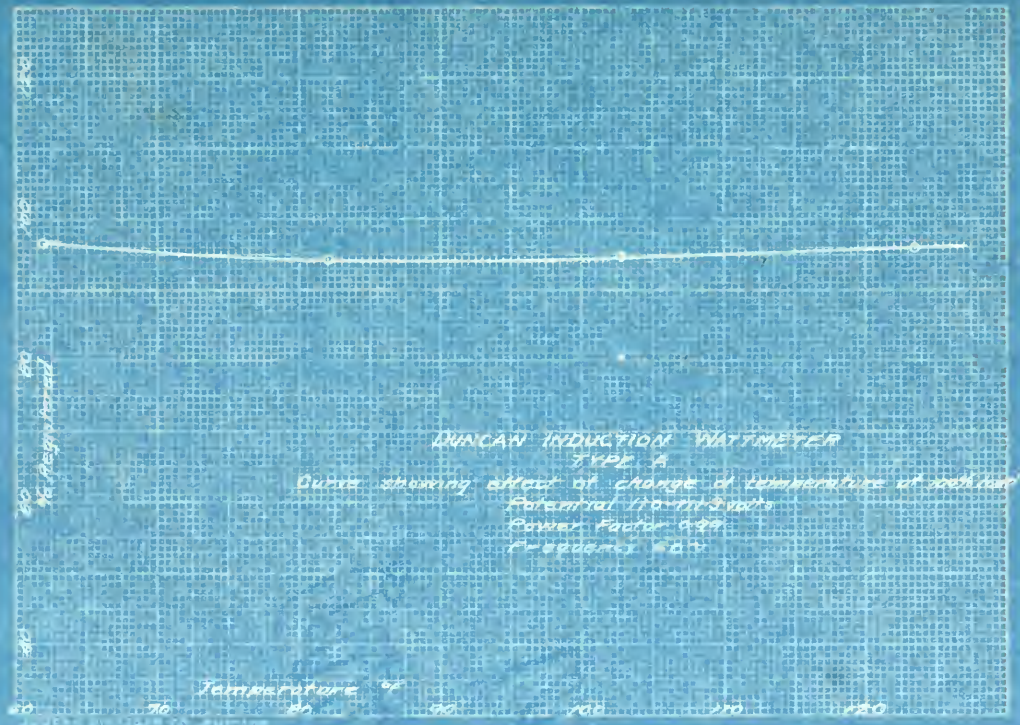
Data showing the effect of change of temperature at 100% load.

Potential = 110 - 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
10.2	62	96.5
10.3	82	94.2
10.3	102.7	94.9
10.3	123.5	96.0



DUNCAN INDUCTION WATTMETER
TYPE A

Curve showing effect of change of temperature at rated load
Potential 110 Three Watts
Power Factor 0.99
Frequency 60 ~

Duncan Induction Wattmeter Type A.

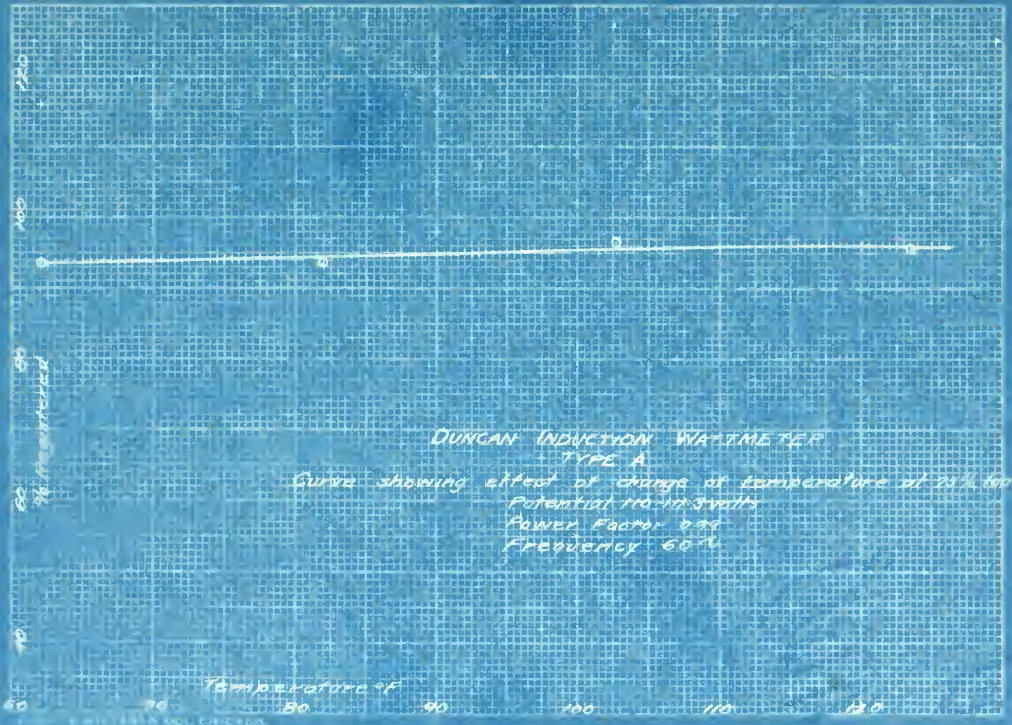
Data showing the effect of change of temperature at 75% load.

Potential = 110 - 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
7.53	62	93.7
7.5	82	93.6
7.5	102.7	96.6
7.5	123.5	95.5



DUNCAN INDUCTION WATTMETER
TYPE A
Curve showing effect of change of temperature at 25% load
Potential rec. 3 volts
Power Factor 0.99
Frequency 60 ~

Duncan Induction Wattmeter Type A.

Data showing the effect of change of temperature at 50% load.

Potential = 110 - 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
5.0	62	90.0
5.25	82	92.7
5.25	102.7	93.7
5.25	123.5	92.7

Duncan Induction Wattmeter Type A,

Data showing the effect of change of temperature at 20% load.

Potential = 110 -111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
2.0	62	86.5
2.0	82	91.0
2.0	102.7	88.7
2.0	123.5	91.3

Duncan Induction Wattmeter Type A.

Shunt Loss = 3 watts at 110 volts and 60 cycles per second.

Series Loss = 3.8 watts at 10 amperes and 60 cycles/second.

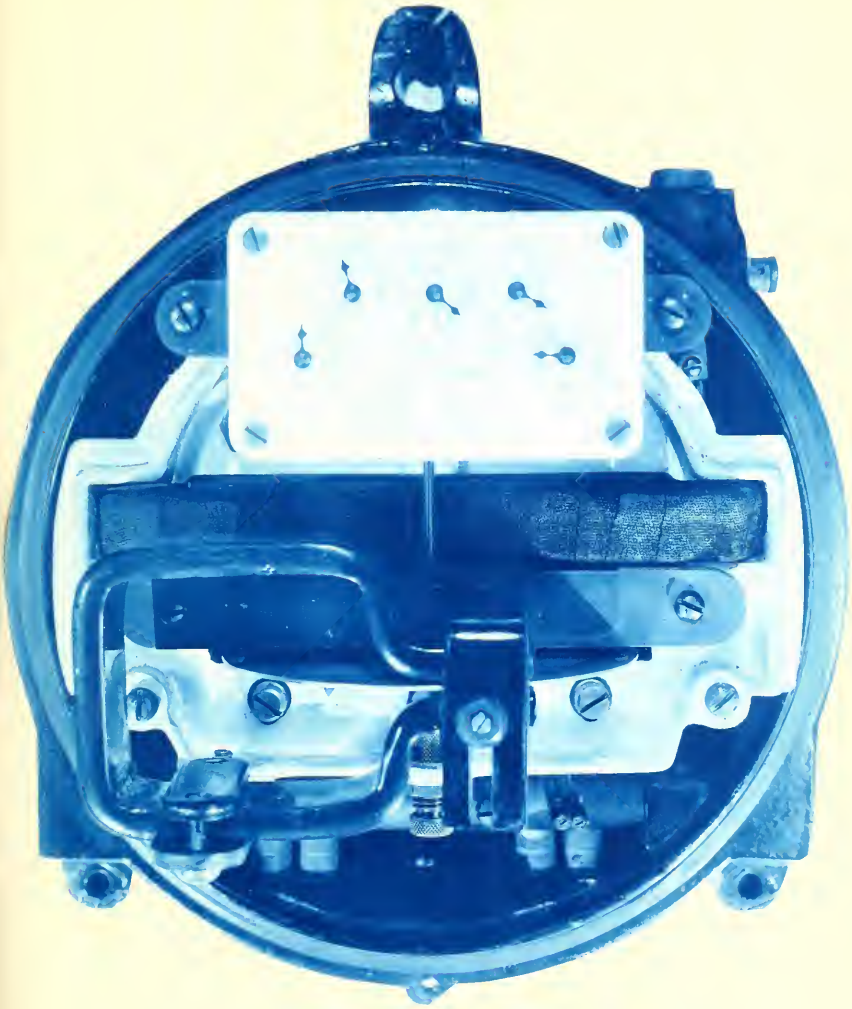
Determination of Flux Quadrature

Amperes	Volts	Watts	Cos θ	θ
9.75	104.3	2.0	.00196	89°53'17''

SCHAEFFER
INDUCTION WATTMETER

TYPE E

NO _____



Schaeffer Induction Wattmeter Type E.

Data showingthe effect of change of load at normal voltage and frequency, and unity power factor.

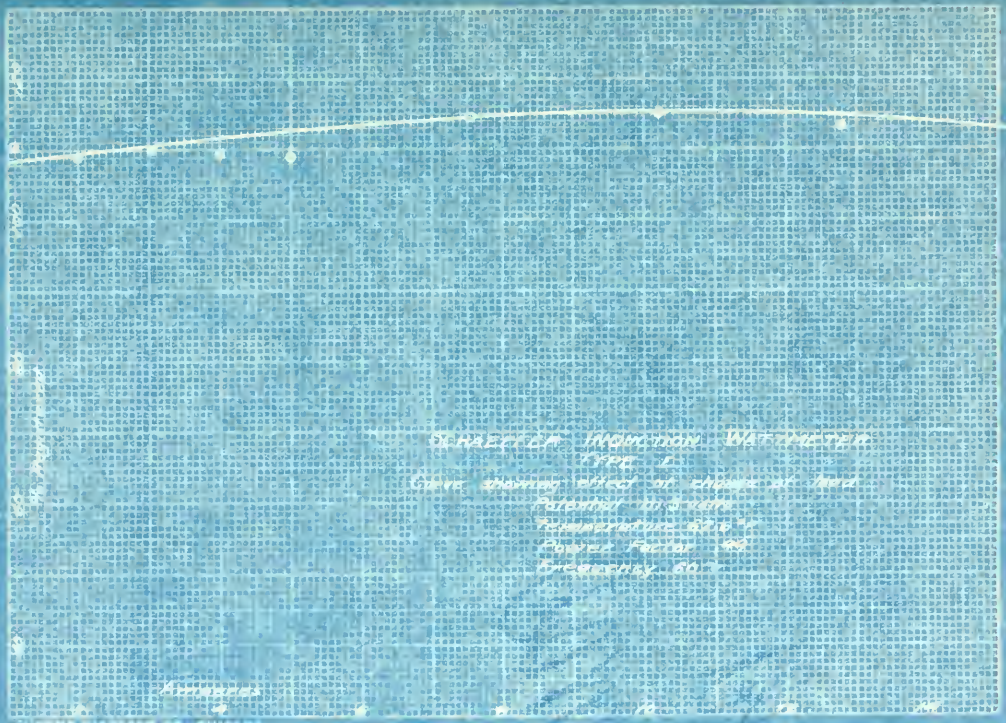
Potential = 111.3 volts

Temperature = 62.6°F.

Power factor = ,99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.45	141.2	158.7	112.2
12.8	117.7	133.3	113.2
10.2	92.1	106.0	115.0
7.53	68.7	78.6	114.5
5.0	47.7	52.0	109.0
4.0	37.8	41.3	109.3
3.03	28.5	31.3	110.0
2.00	18.9	20.6	109.0
1.09	9.65	10.66	110.2



Schaeffer Induction Wattmeter Type E.

Data showing the effect of change of load at normal frequency, unity power factor, and 75% normal voltage.

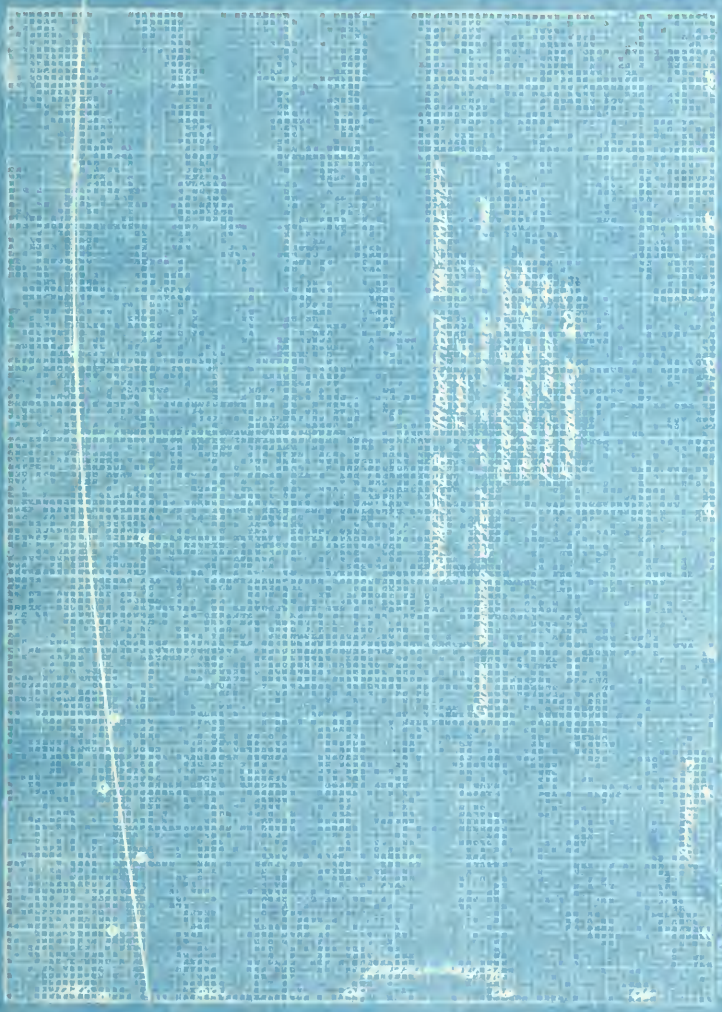
Potential = 81.7 volts

Temperature = 62.5°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.45	104.0	123.3	118.6
12.8	85.7	103.2	120.5
10.2	68.2	82.0	120.2
7.53	51.2	60.6	110.2
5.0	35.4	40.6	114.8
4.0	27.6	32.0	116.0
3.03	21.75	24.0	110.5
2.00	15.7	18.0	114.5
1.05	6.9	8.0	116.0



Schaeffer Induction Wattmeter Type E.

Data showing the effect of change of load at normal frequency, unity power factor, and 90% normal voltage.

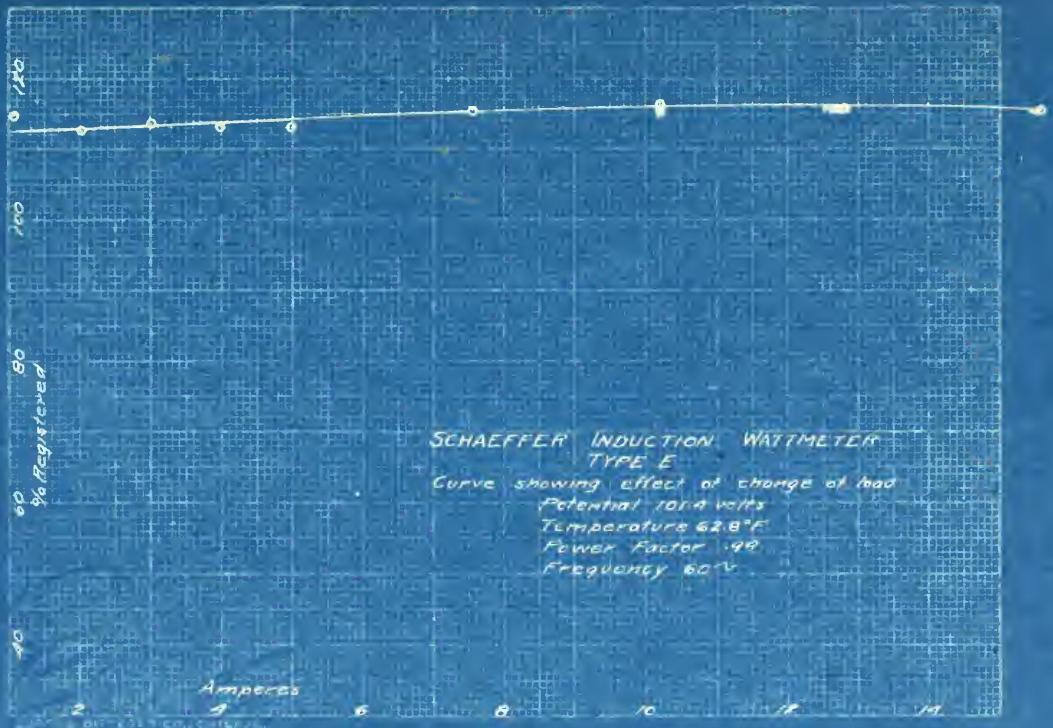
Potential = 101.4 volts

Temperature = 62.8°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.45	127.9	147.2	115.2
12.8	106.0	122.8	115.8
10.2	83.8	97.4	116.1
7.53	62.9	72.6	115.5
5.0	43.0	48.6	113.0
4.0	34.2	38.6	113.0
3.03	25.8	29.3	113.6
2.02	20.1	22.6	112.5
1.05	8.72	10.0	114.8



SCHAEFFER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of load
Potential 101.9 volts
Temperature 62.8°F
Power Factor .99
Frequency 60 ~

Schaeffer Induction Wattmeter Type E.

Data showing the effect of change of load at normal frequency, unity power factor, and 110% normal voltage.

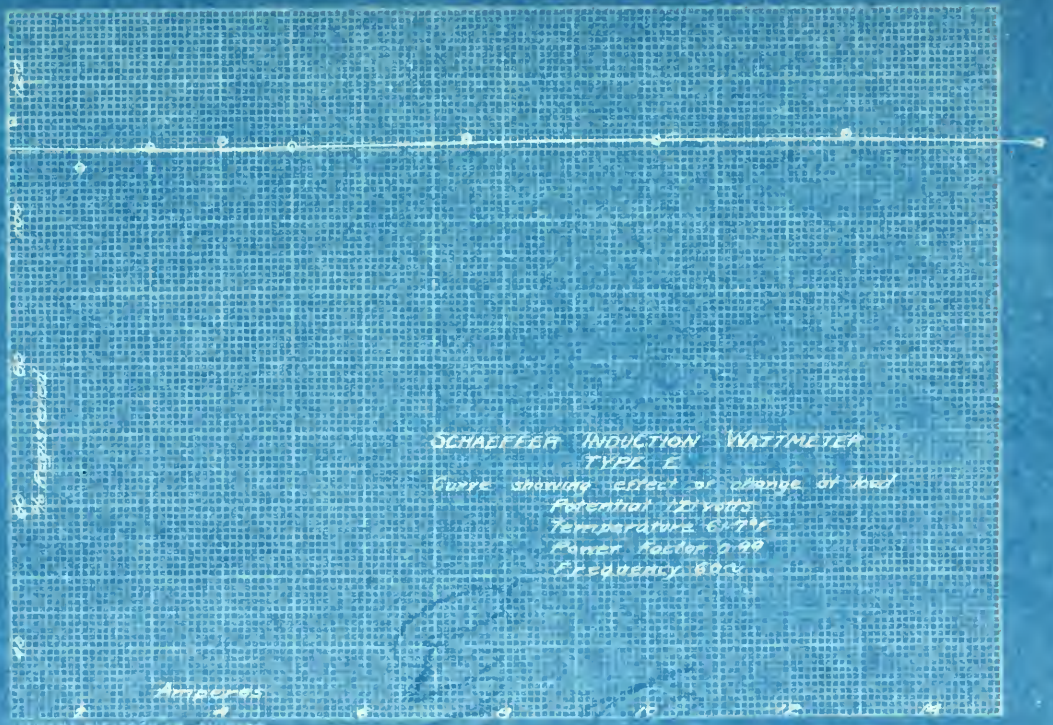
Potential = 121 volts

Temperature = 61.7°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	156.8	173.2	110.5
12.85	129.9	145.2	112.0
10.16	102.6	114.0	111.0
7.48	74.6	83.3	111.5
5.0	50.3	55.4	110.2
4.03	40.8	45.4	111.2
3.01	30.8	34.0	110.2
2.02	19.8	21.3	107.8
1.08	9.36	10.7	114.2


% Registration
Amperes
SCHAEFFER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of load
Potential 120 volts
Temperature 67°F
Power Factor 0.90
Frequency 60~

Schaeffer Induction Wattmeter Type E.

Data showing the effect of change of load at normal voltage, unity pwer factor, and 66% normal frequency.

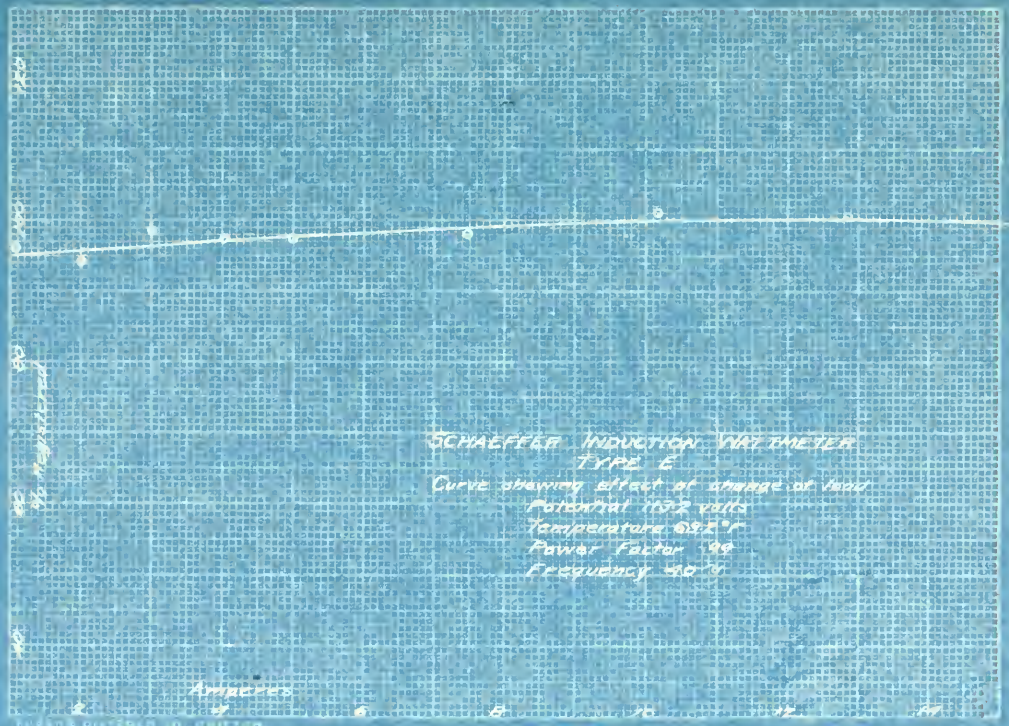
Potential = 113.2 volts

Temperature = 63.2°F.

Power factor = .99

Frequency = 40 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	143.5	142.0	99.0
12.85	117.5	118.0	100.3
10.16	92.4	93.4	101.0
7.48	69.4	68.0	98.0
5.0	46.7	45.4	97.3
4.03	36.85	36.0	97.6
3.01	27.8	27.4	98.5
2.02	18.4	17.3	94.0
1.08	8.32	8.0	96.0


SCHAEFFER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of load
Potential 115.5 volts
Temperature 65.1° F
Power Factor 90
Frequency 40.0 ~
Amperes
8
10
12

Schaeffer Induction Wattmeter Type E.

Data showing the effect of change of load at normal voltage, unity power factor, and 133⅓% normal frequency.

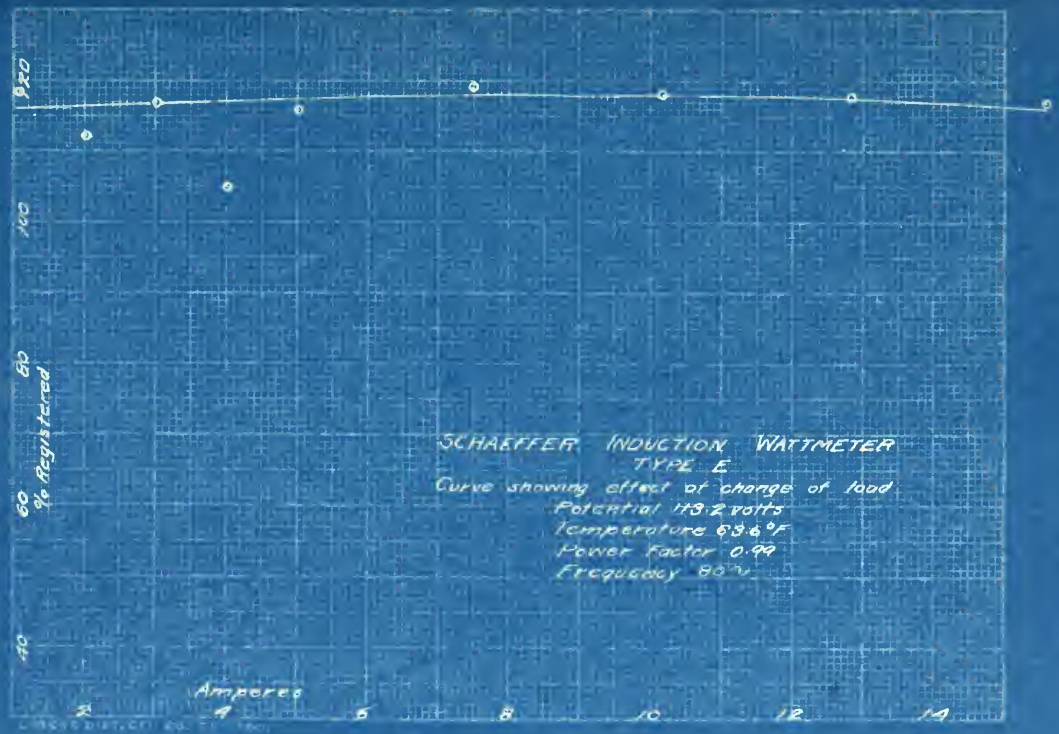
Potential = 113.2 volts

Temperature = 63.6°F.

Power factor = .99

Frequency = 80 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	142.0	166.0	116.9
12.85	117.0	137.2	117.5
10.16	93.8	110.6	118.0
7.48	69.5	82.6	119.0
5.0	47.8	55.3	115.8
4.03	37.5	39.3	104.9
3.01	27.9	32.6	117.0
2.02	19.0	21.3	112.1
1.08	9.04	10.7	118.3



SCHAEFFER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of load
Potential 113.2 volts
Temperature 63.6°F
Power Factor 0.99
Frequency 60 ~

Schaeffer Induction Wattmeter Type E.

Data showing the effect of change of load at normal voltage and frequency, and 75% power factor.

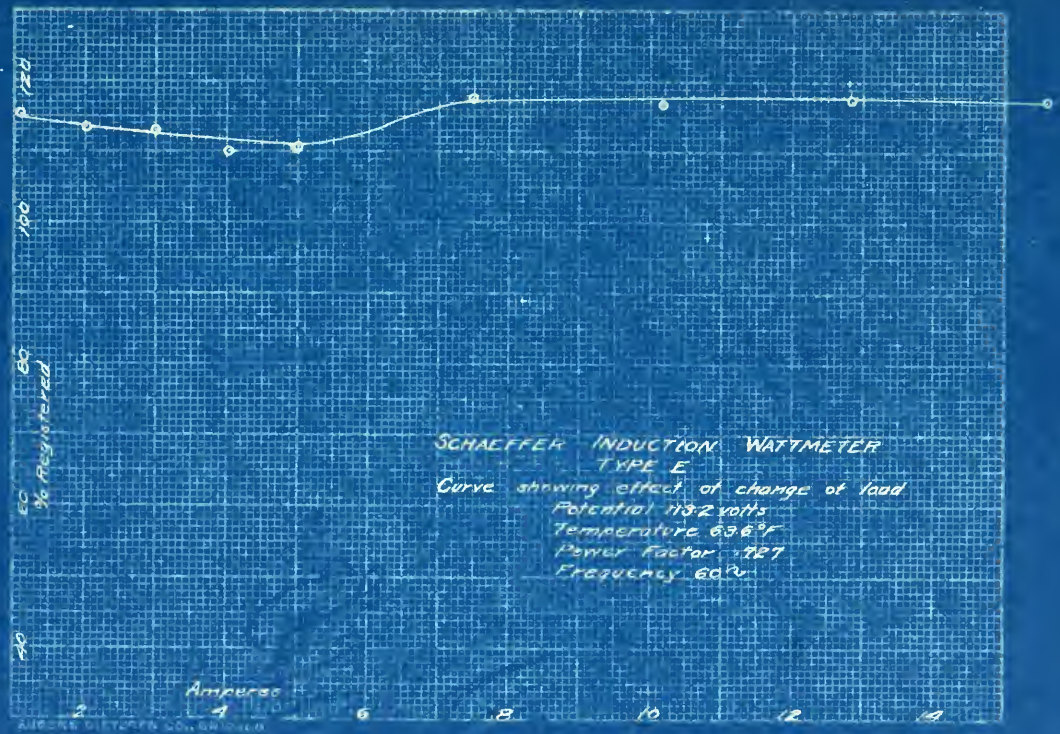
Potential = 113.2 volts

Temperature = 63.6°F.

Power factor = .727

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	101.1	118.8	117.2
12.85	84.9	99.4	117.1
10.16	68.5	80.0	116.9
7.48	51.0	60.0	117.7
5.0	33.8	37.3	110.6
4.03	27.85	30.6	110.0
3.01	21.77	24.6	113.0
2.02	14.1	16.0	113.5
1.08	7.47	8.6	115.1



SCHAEFFER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of load
Potential 119.2 volts
Temperature 63.6°F
Power Factor .727
Frequency 60~

Schaeffer Induction Wattmeter Type E.

Data showing the effect of change of load at normal voltage and frequency, and 50% power factor.

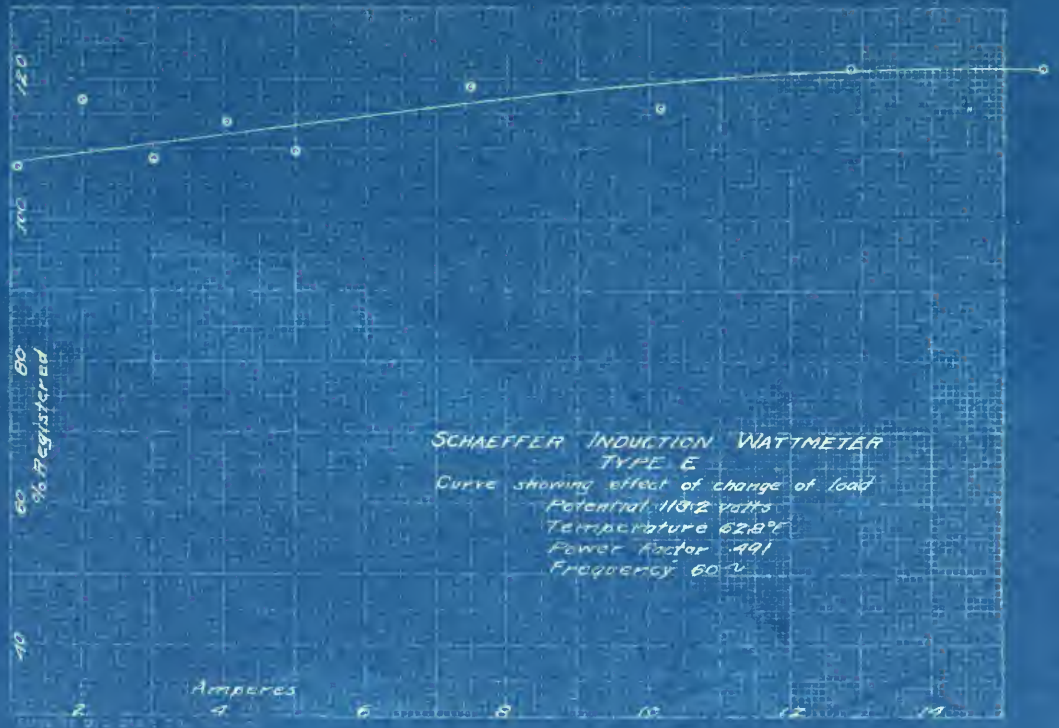
Potential = 113.2 volts

Temperature = 62.8°F.

Power factor = .491

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	68.3	82.6	121.0
12.85	57.1	69.4	121.4
10.16	47.2	54.6	115.9
7.48	35.3	42.0	119.0
5.0	23.7	26.0	109.8
4.03	18.7	21.3	114.0
3.01	14.1	15.3	108.3
2.02	9.16	10.7	117.0
1.08	4.93	5.3	107.5


120
100
80
60
40
% Registered
Amperes
2
4
6
8
10
12
14
SCHAEFFER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of load
Potential 119.2 volts
Temperature 62.8°F
Power Factor .991
Frequency 60 ~

Schaeffer Induction Wattmeter Type E.

Data showing the effect of change of load at normal voltage and frequency, and unity power factor.

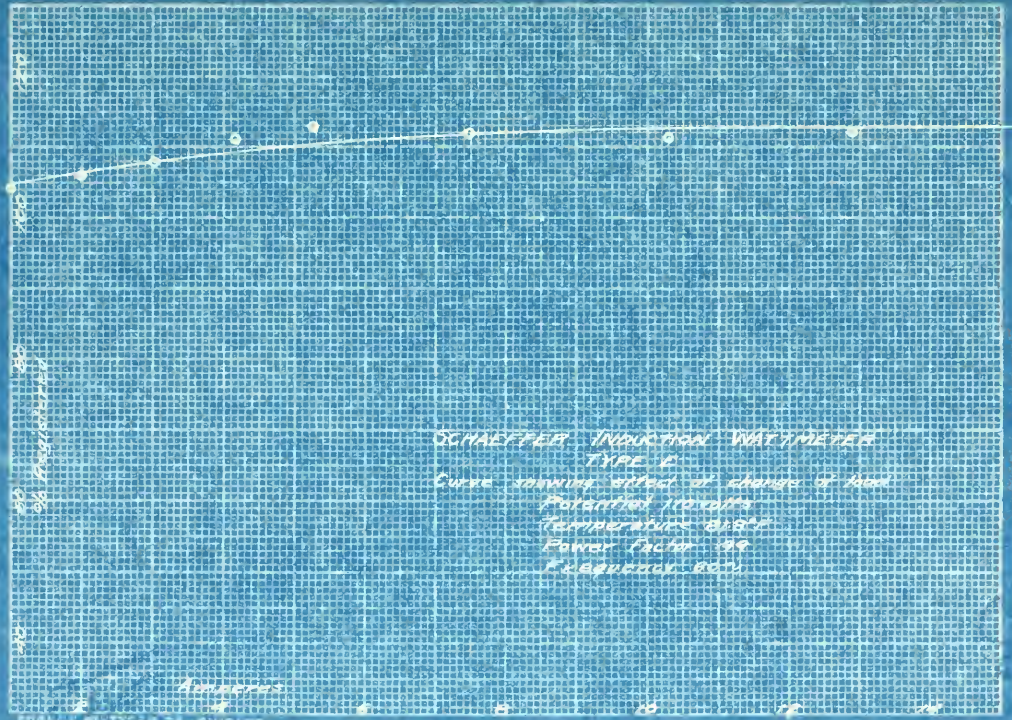
Potential = 110 volts

Temperature = 81.8°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	137.0	154.7	112.9
12.9	115.5	129.3	112.0
10.3	91.2	101.2	111.0
7.5	66.8	74.6	111.8
5.25	44.3	50.0	112.9
4.18	37.8	42.0	111.0
3.02	26.45	28.6	108.0
2.00	17.6	18.6	105.8
0.98	8.31	8.66	104.1


DC WATT-HOUR | INDUCTION | WATT-HOUR METER
TYPE I-2
Curve showing effect of change of load
Potential Normal
Temperature 25°C
Power Factor 1.0
Frequency 60 ~
Amperes
Per Cent Accuracy

Schaeffer Induction Wattmeter Type E.

Data showing the effect of change of load at normal voltage and frequency, and unity power factor.

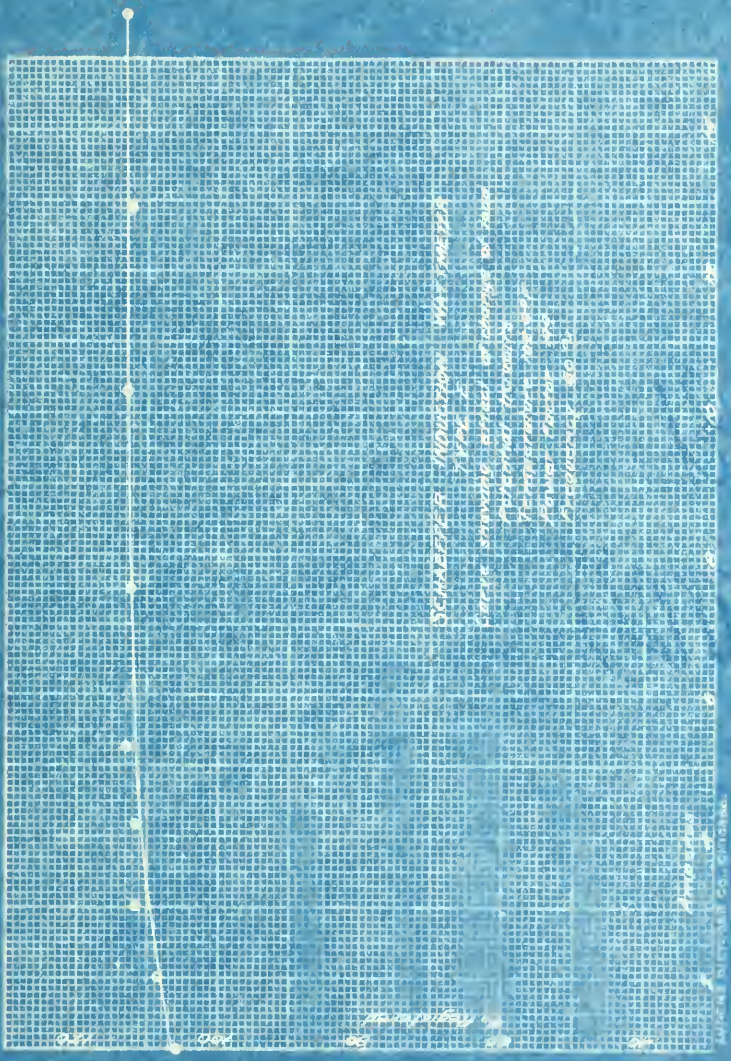
Potential = 110 volts

Temperature = 102.9°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	138.0	156.0	113.0
12.9	116.0	130.0	112.0
10.3	91.0	102.7	112.9
7.5	67.1	75.3	112.2
5.25	44.8	50.6	113.0
4.18	38.2	42.6	111.4
3.02	26.9	30.0	111.4
2.00	18.4	20.0	108.7
0.98	8.74	9.3	106.0



Schaeffer Induction Wattmeter Type E.

Data showing the effect of change of load at normal voltage and frequency, and unity power factor.

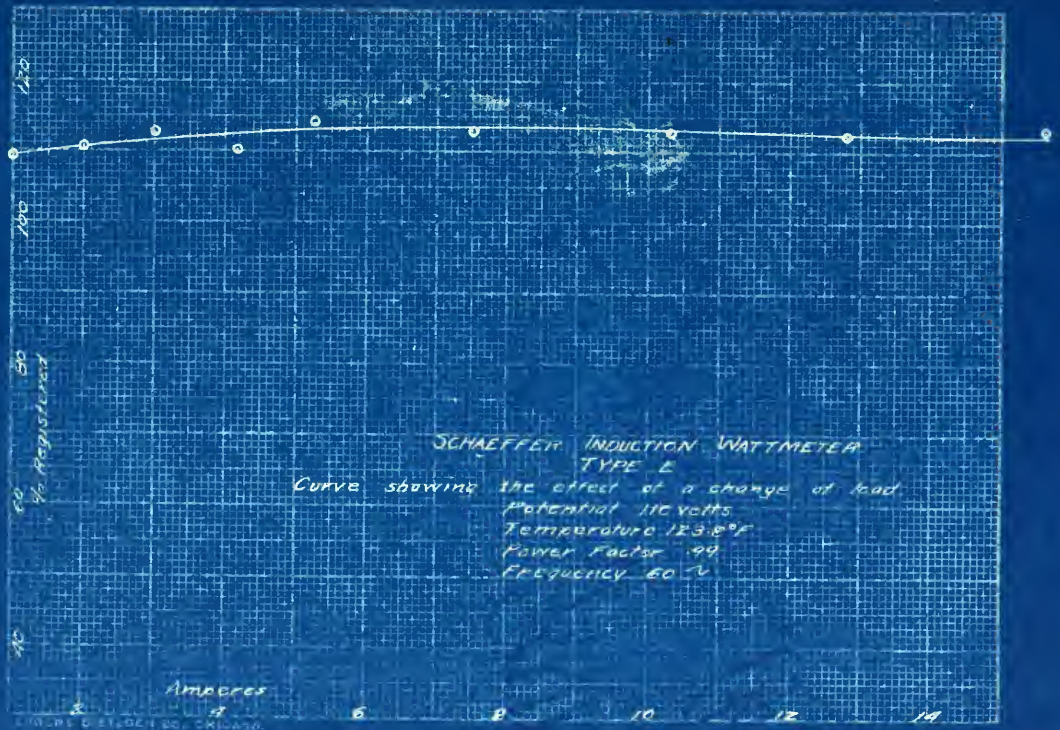
Potential = 110 volts

Temperature = 123.8°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	138.9	156.7	112.9
12.8	115.9	130.0	112.2
10.3	91.5	103.2	112.9
7.5	67.2	76.0	113.0
5.25	45.0	51.3	114.0
4.18	36.9	40.6	110.0
3.02	27.8	31.3	112.5
2.00	18.1	20.0	110.5
0.98	8.5	9.3	109.3



SCHAEFFER INDUCTION WATTMETER
TYPE E

Curve showing the effect of a change of load
Potential 110 volts
Temperature 123.8°F
Power Factor .99
Frequency 60 ~

SIMONS & EISNER CO. CHICAGO

Schaeffer Induction Wattmeter Type E.

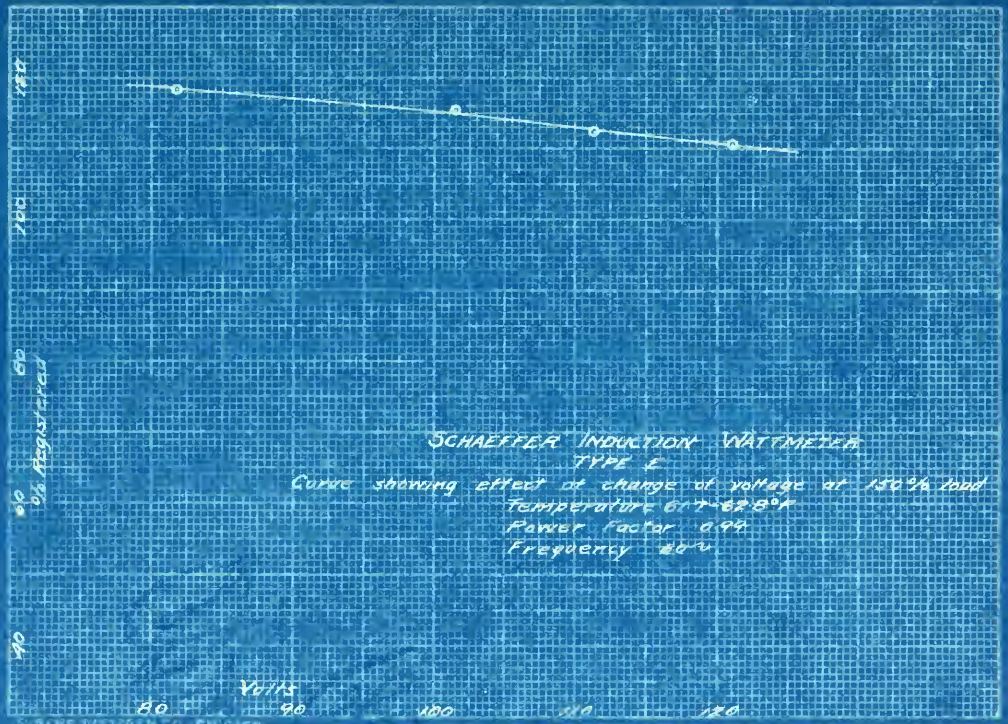
Data showihg the effectof change of voltage at 150% load.

Temperature = 61.7 - 62.8°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
15.45	81.7	118.6
15.45	101.4	115.2
15.45	111.3	112.2
15.53	121.0	110.5



SCHAEFFER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of voltage at 15 Amp load
Temperature 61°F - 62.8°F
Power factor 0.99
Frequency 60~

Schaeffer Induction Wattmeter Type E.

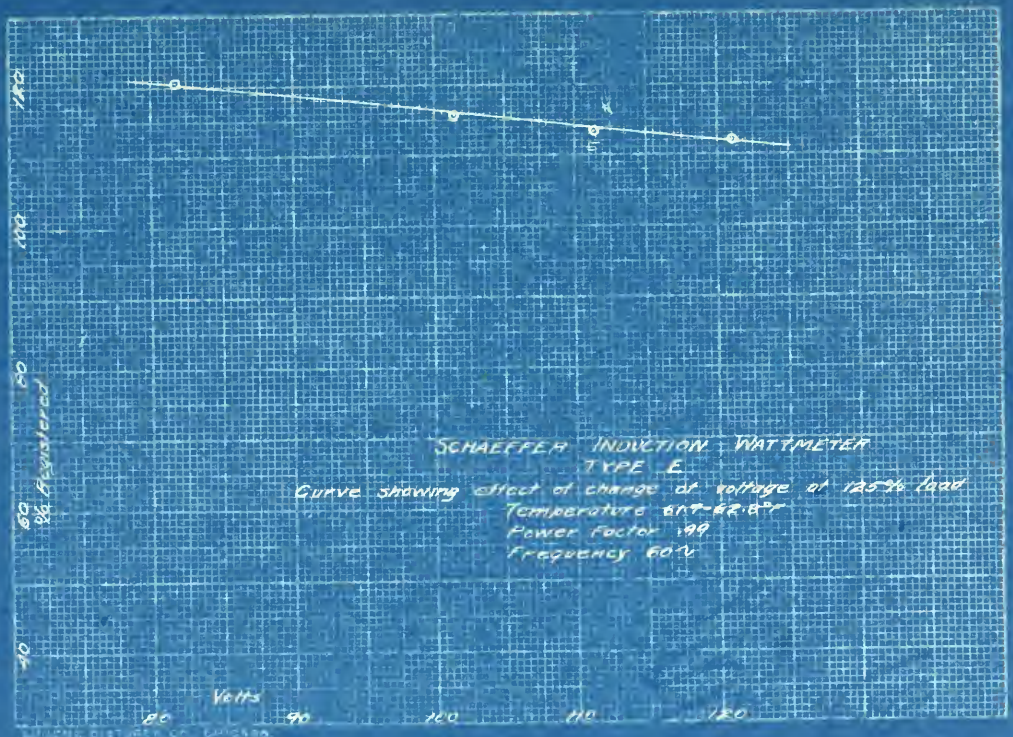
Data showing the effect of change of voltage at125% load.

Temperature = 61.7 - 63.8°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
12.8	81.7	120.5
12.8	101.4	115.8
12.8	111.3	113.2
12.85	121.0	112.0



SCHAEFFER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of voltage at 125% load
Temperature 61°-62.8°F
Power Factor .99
Frequency 60~

LIBRARY OF THE UNIVERSITY OF ILLINOIS

Schaeffer Induction Wattmeter Type E.

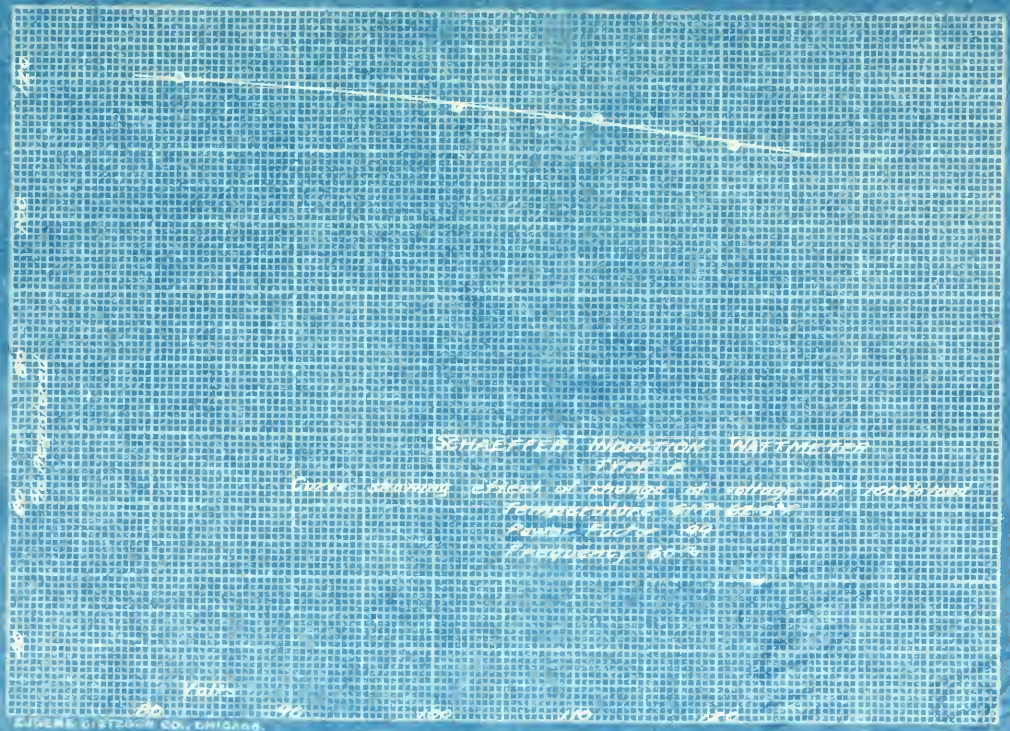
Data showing the effect of change of voltage at 100% load.

Temperature = 61.7 - 62.8°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
10.2	81.7	120.2
10.2	101.4	116.1
10.2	111.3	115.0
10.16	121.0	111.0



EUGENE DIETZGEN CO. CHICAGO.

Schaeffer Induction Wattmeter Type E.

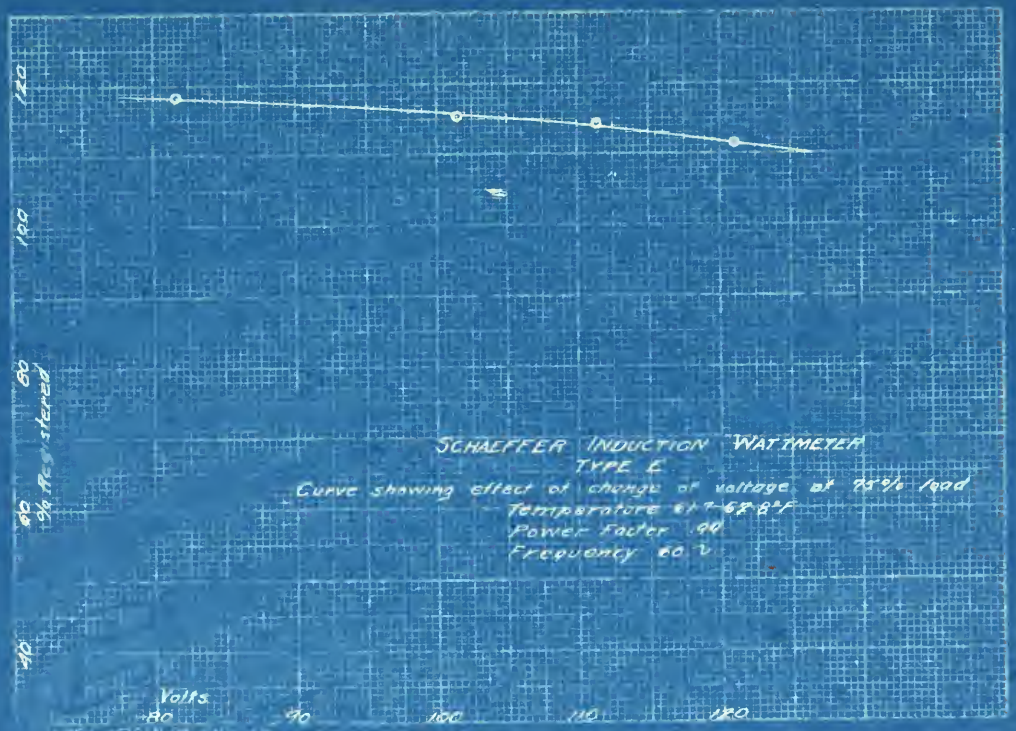
Data showing the effect of change of voltage at 75% load.

Temperature = 61.7 - 62.8°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
7.53	81.7	118.2
7.53	101.4	115.5
7.53	111.3	114.5
7.48	121.0	111.5



SCHAEFFER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of voltage at 75% load
Temperature 67° F
Power Factor 90
Frequency 60 ~

Schaeffer Induction Wattmeter Type E.

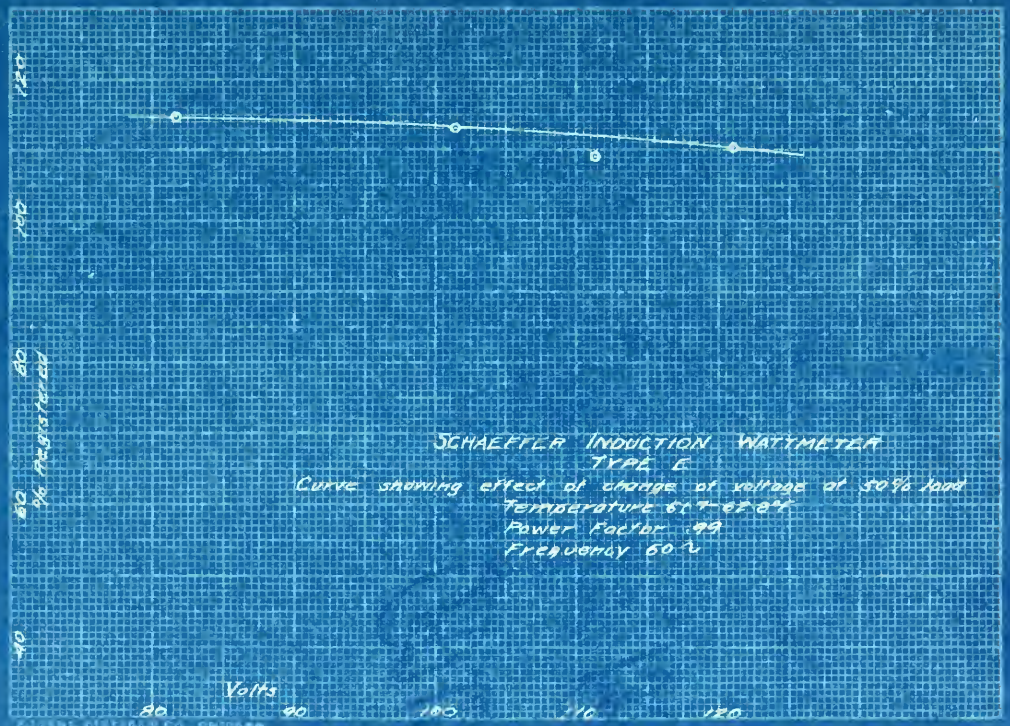
Data showing the effect of change of voltage at 50% load.

Temperature = 61.7 - 62.8°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
5.0	81.7	114.8
5.0	101.4	113.0
5.0	111.3	109.0
5.0	121.0	110.2



SCHAEFFER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of voltage at 50% load
Temperature 61°-67.5°F.
Power Factor .99
Frequency 60 ~

Schaeffer Induction Wattmeter Type E.

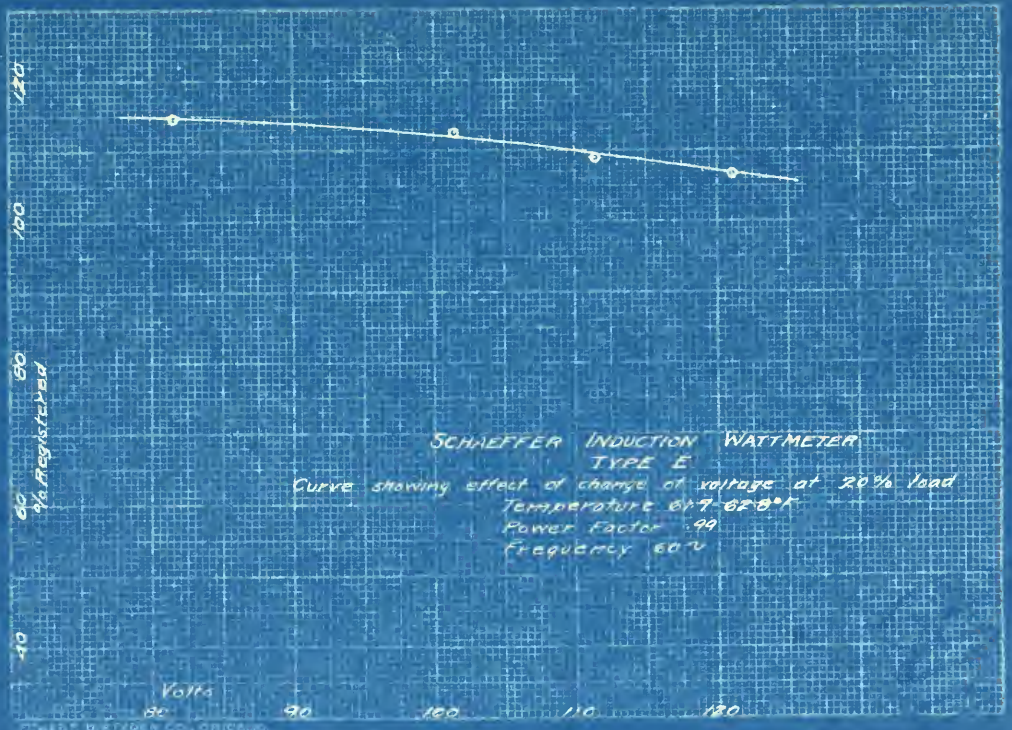
Data showing the effect of change of voltage at 20% load.

Temperature = 61.7 - 62.8°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
2.02	81.7	114.5
2.02	101.4	112.5
2.02	111.3	109.0
2.02	121.0	107.8



SCHAEFFER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of voltage at 20% load
Temperature 61°F-62.8°F
Power Factor .99
Frequency 60~

STRIEBY & STEGEMAN CO., CHICAGO.

Schaeffer Induction Wattmeter Type E.

Data showing the effect of change of frequency at 150% load.

Potential = 111.3 - 113.2 volts

Temperature = 62.6 - 63.6°F.

Power factor = .99

Current	Frequency	% Registered
15.53	40	99.0
15.45	60	112.2
15.53	80	116.9

Percentage of Maximum Speed
Time in Seconds
Distance in Feet
Scale of Feet
Distance Required for Attaining Maximum Speed
Time Required for Attaining Maximum Speed
Acceleration Curve for Passenger Elevator
Equipped with Direct Current Motor
Variable Voltage Control
Test Made by
Date

Schaeffer Induction Wattmeter Type E.

Data showing the effect of change of frequency at 125% load.

Potential = 111.3 - 113.2 volts

Temperature = 62.6 - 63.6°F.

Power factor = .99

Current	Frequency	% Registered
12.85	40	100.3
12.8	60	113.2
12.85	80	117.5

Percentage
Per Cent
Frequency
Number of Students
Deviation from Average
Distribution of Students
Normal Frequency Curve

Schaeffer Induction Wattmeter Type E.

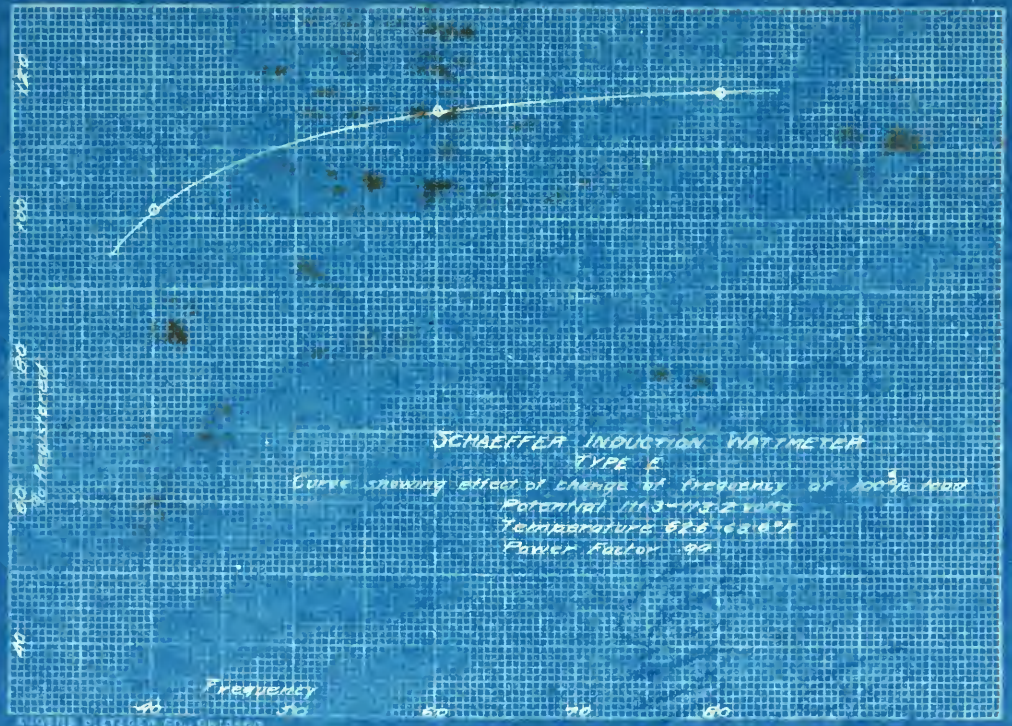
Data showimg the effect of change of frequency at 100% load.

Potential = 111.3 - 113.2 volts

Temperature = 62.6 - 63.6°F.

Power factor = .99

Current	Frequency	% Registered
10.16	40	101.0
10.2	60	115.0
10.16	80	118.0


SCHAEFFER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of frequency at 100% load
Potential 113-117.2 volts
Temperature 61.6-63.6°F.
Power factor .99
Per Cent Error
Frequency
40
50
60
70
80

Schaeffer Induction Wattmeter Type E.

Data showing the effect of change of frequency at 75% load.

Potential = 111.3 - 113.2 volts

Temperature = 62.6 - 63.6°F.

Power factor = .99

Current	Frequency	% Registered
7.48	40	98.0
7.53	60	114.5
7.48	80	119.0

Schaeffer Induction Wattmeter Type E.

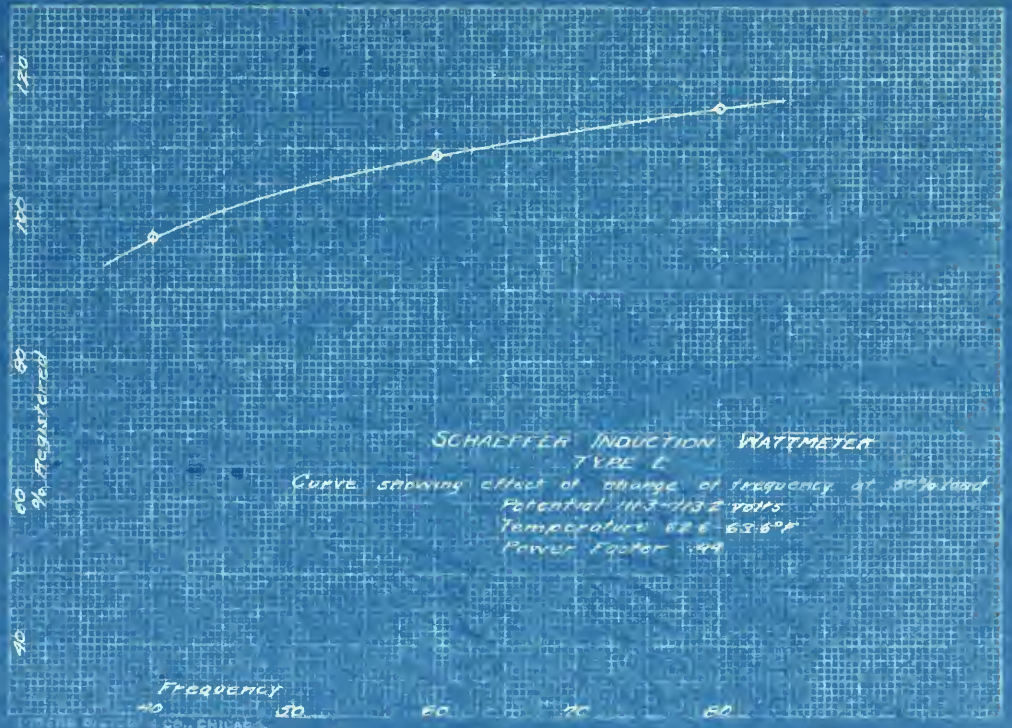
Data showing the effect of change of frequency at 50% load.

Potential = 111.3 - 113.2 volts

Temperature = 62.6 - 63.6°F.

Power factor = .99

Current	Frequency	% Registered
5.0	40	97.3
5.0	60	109.0
5.0	80	115.8



SCHAEFFER INDUCTION WATTMETER
TYPE C
Curve showing effect of change of frequency at 5% load
Potential 111.3-113.2 volts
Temperature 62.6 - 63.6°F
Power Factor 1.00

LUDLOW-BLAKE & CO., CHICAGO

Schaeffer Induction Wattmeter Type E.

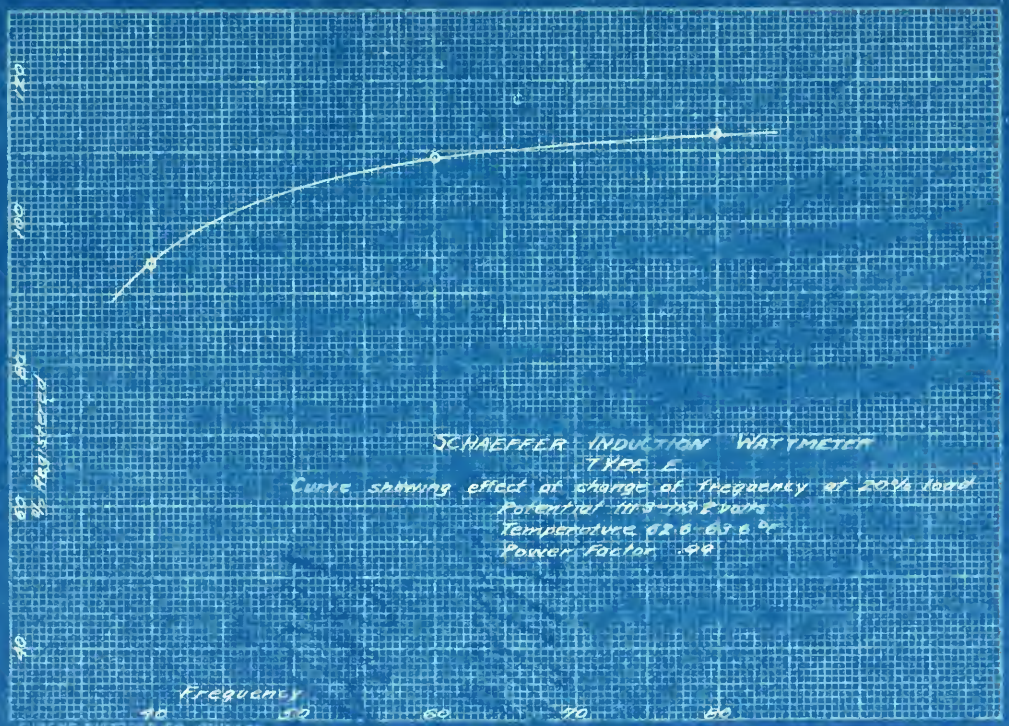
Data showing the effect of change of frquency at 20% load.

Potential = 111.3 - 113.2 volts

Temperature = 62.6 - 63.6°F.

Power factor = .99

Current	Frequency	% Registered
2.02	40	94.0
2.02	60	109.0
2.02	80	112.1


SCHAEFFER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of frequency at 208 load
Potential 111.3 - 111.5 volts
Temperature 62.6 65.6 °F
Power Factor .98
Per Cent
Frequency
40
50
60
70
80

Schaeffer Induction Wattmeter Type E.

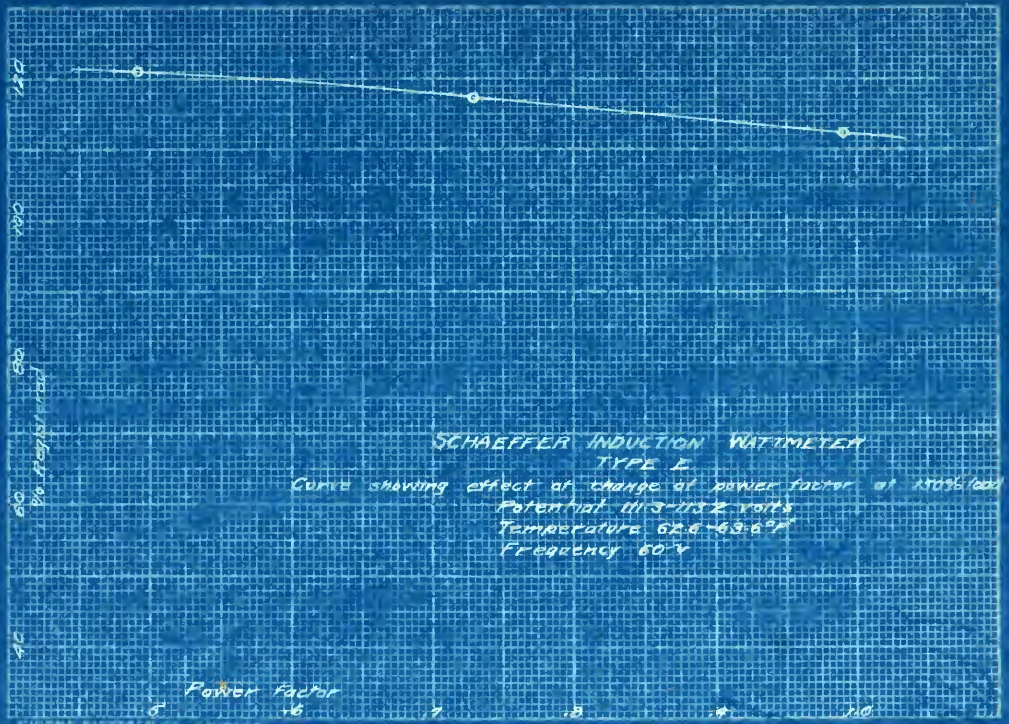
Data showing the effect of change of power factor at 150% load.

Potential = 111.3 - 113.2 volts

Temperature = 62.6 - 63.6°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
15.53	.491	121.0
15.53	.727	117.2
15.45	.99	112.2


SCHAEFFER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of power factor at 100% load
Potential 111.3-113.2 volts
Temperature 62.6-63.6°F
Frequency 60 ~
Per cent of full load
Power factor
100
99
98
97
.6
.7
.8
.9
1.0

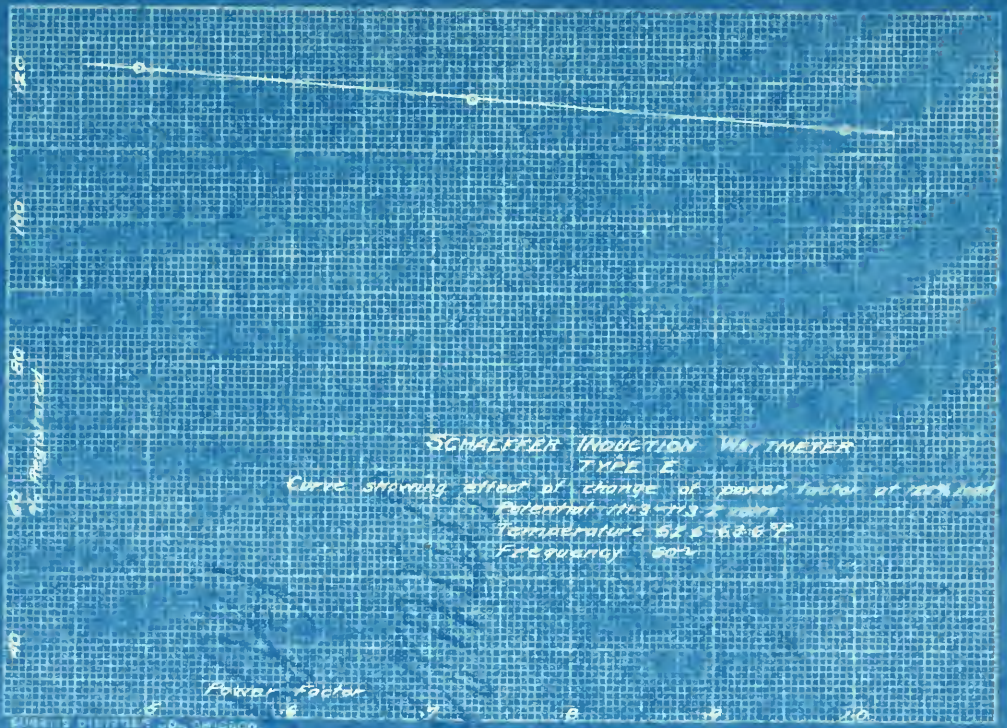
Schaeffer Induction Wattmeter Type E.

Data showing the effect of change of power factor at 125% load. Potential = 111.3 - 113.2 volts

Temperature = 62.6 - 63.6°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
12.85	.491	121.4
12.85	.727	117.1
12.8	.99	113.2


SCHALTER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of power factor at constant
Potential magnets 2 coils
Temperature 64.5 - 66.2 °F
Frequency 60~
Power factor
Percent of rated load
140
120
100
80
60
40
.6
.7
.8
.9
1.0

Schaeffer Induction Wattmeter Type E.

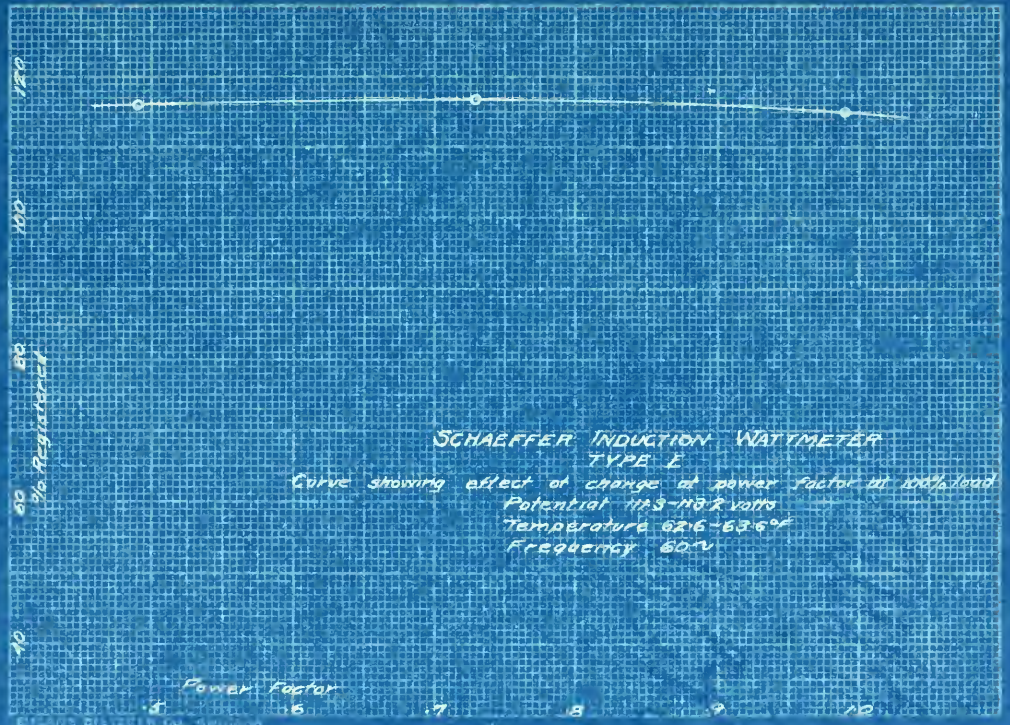
Data showing the effect of change of power factor at 100% load.

Potential = 111.3 - 113.2 volts

Temperature = 62.6 - 63.6°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
10.16	.491	115.9
10.16	.727	116.9
10.2	.99	115.0



SCHAEFFER INDUCTION WATTMETER
TYPE L
Curve showing effect of change of power factor at 100% load
Potential 113-117 volts
Temperature 62.6-63.6°F
Frequency 60~

Schaeffer InductionWattmeter Type E.

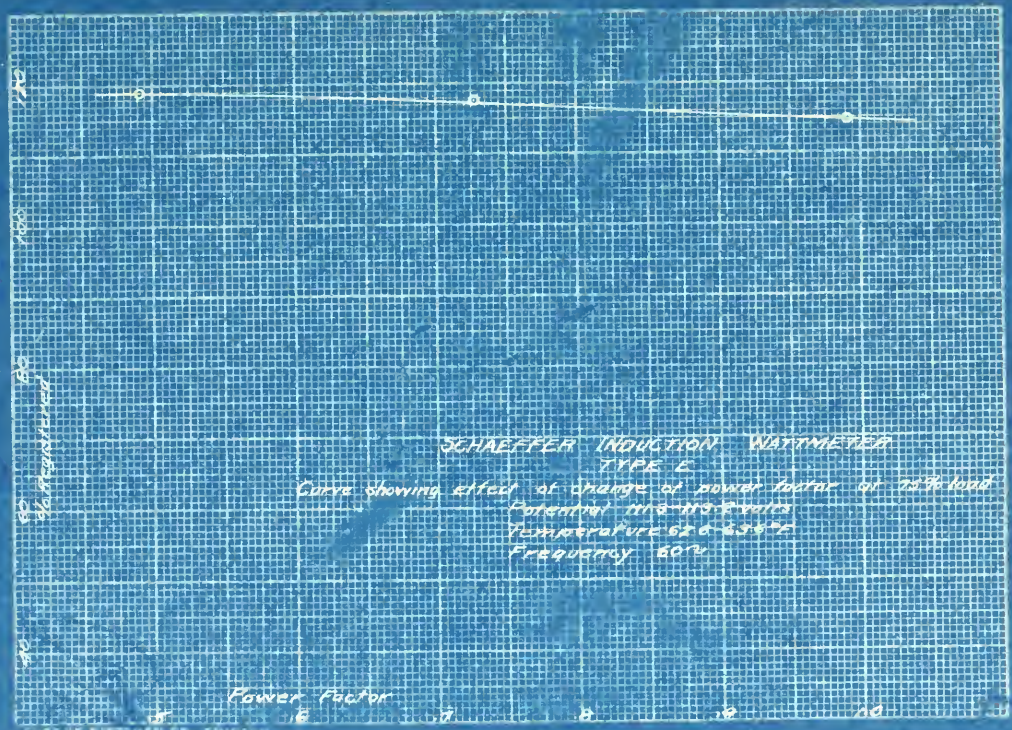
Data showing the effect of change of power factor at 75% load.

Potential = 111.3 - 113.2 volts

Temperature = 62.6 - 63.6°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
7.48	.491	119.0
7.48	.727	117.7
7.53	.99	114.5


SCHAEFFER INDUCTION WATTMETER
TYPE C
Curve showing effect of change of power factor at 10% load
Potential one hundred volts
Temperature 62° C. 143° F.
Frequency 60~
Power Factor
Percentage Error
.5
.6
.7
.8
.9
1.0

Schaeffer Induction Wattmeter Type E.

Data showing the effect of change of power factor at 50% load.

Potential = 111.3 - 113.2 volts

Temperature = 62.6 - 63.6°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
5.0	.491	109.8
5.0	.727	110.6
5.0	.99	109.0

SCHAEFFER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of power factor at full load
Potential impressed volts
Temperature 62.6 deg F
Frequency 60 ~
% Registration
Power Factor
.5
.6
.7
.8
.9
1.0
EUGENE DIETZGEN CO. CHICAGO

Schaeffer induction Wattmeter Type E.

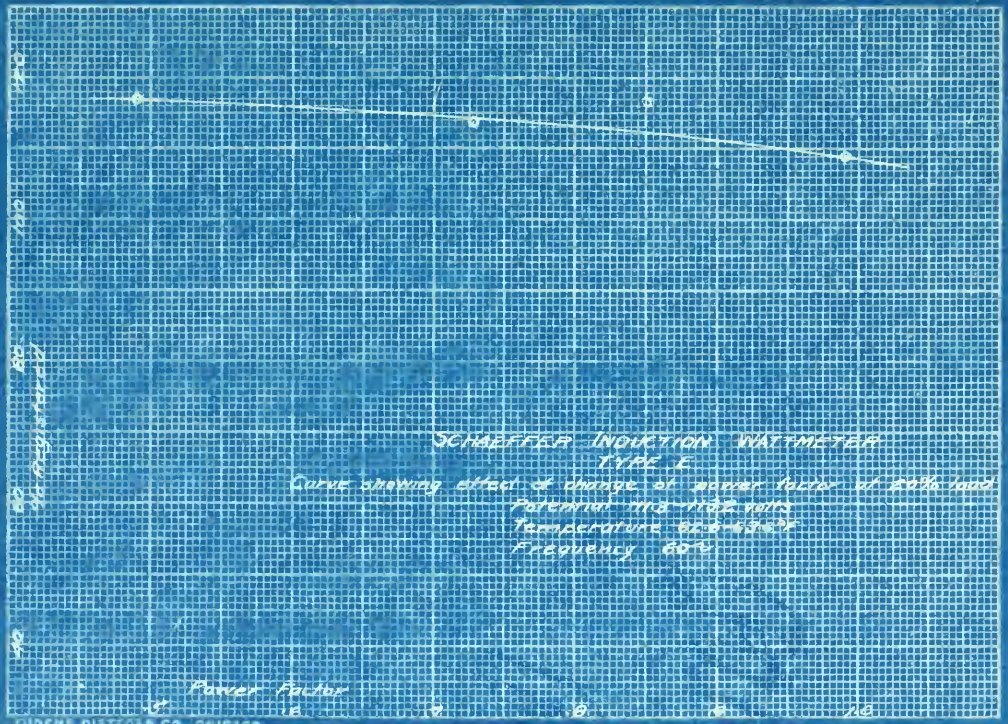
Data showing the effect of change of power factor at 20% load.

Potential = 111.3 - 113.2 volts

Temperature = 62.6 - 63.6°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
2.02	.491	117.0
2.02	.727	113.5
2.02	.99	109.0



SCHAEFFER INDUCTION WATTMETER
Type E
Curve showing effect of change of power factor at 220 volts
Potential and current coils
Temperature 65° F
Frequency 60~

EUGENE DIETZGEN CO., CHICAGO

Schaeffer Induction Wattmeter Type E.

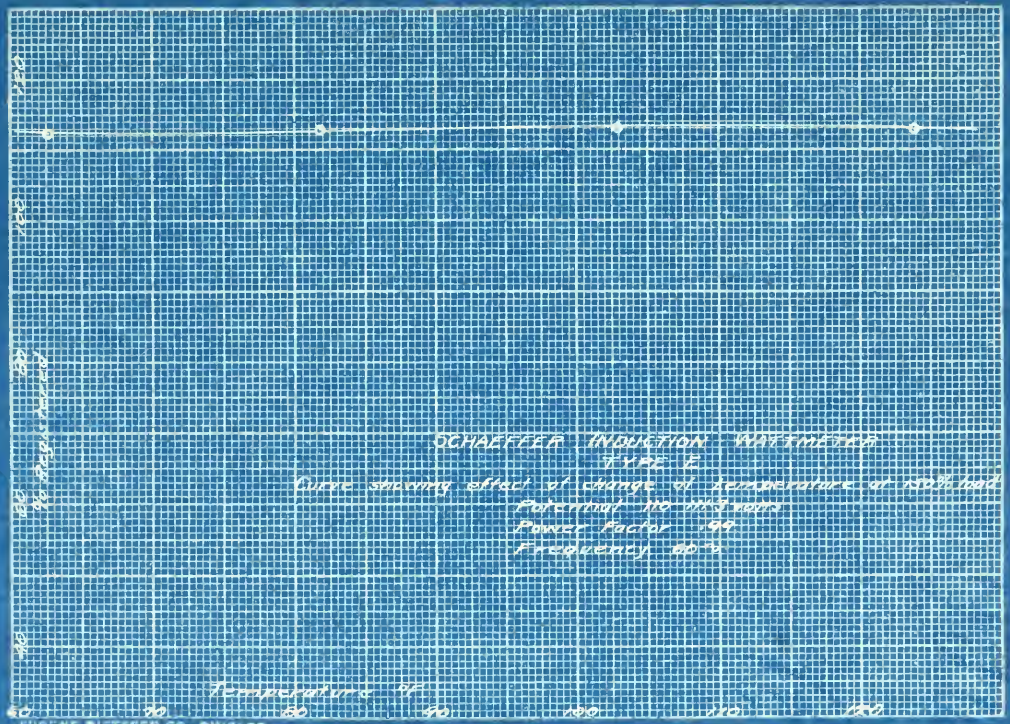
Data showing the effect of change of temperature at 150% load.

Potential = 111.3 - 113.2 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
15.45	62.6	112.2
15.6	81.8	112.9
15.6	102.9	113.0
15.6	123.8	112.9


SCHAEFFER INDUCTION WATTHOUR-METER
TYPE E
Curve showing effect of change of temperature on registration
Corresponding to one hour
Power Factor 100
Frequency 60~
Temperature °F
EUGENE DIETZGEN CO., CHICAGO

Schaeffer Induction Wattmeter Type E.

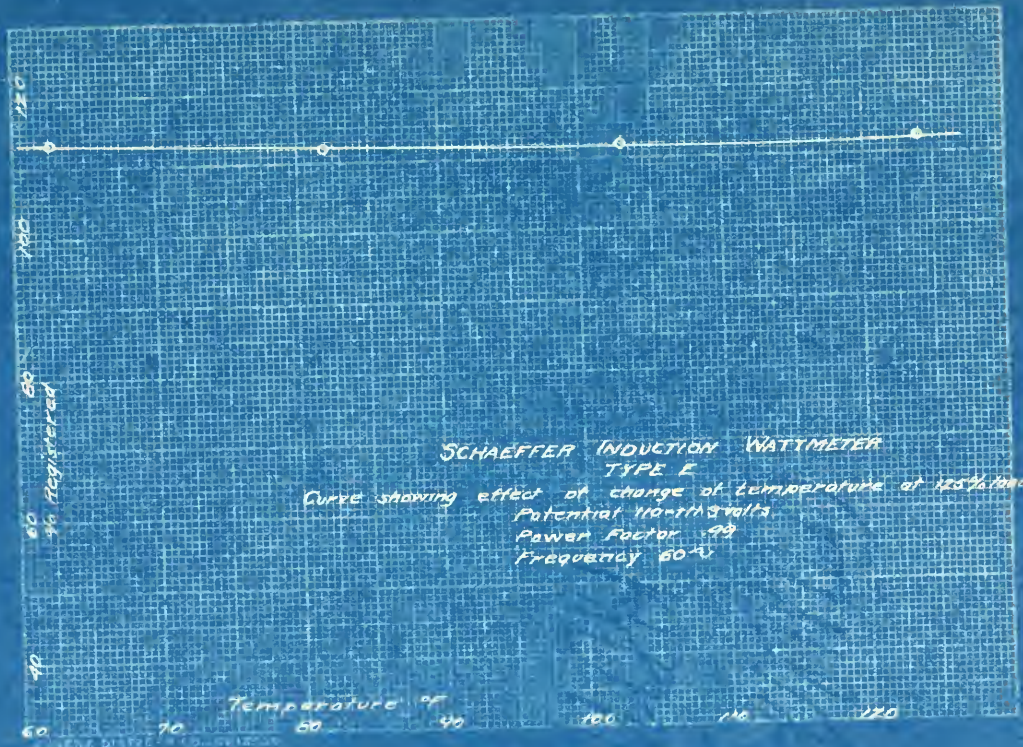
Data showing the effect of change of temperature at 125% load.

Potential = 110 - 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	Registered %
12.8	62.6	113.2
12.9	81.8	112.0
12.9	102.9	112.0
12.8	123.8	112.2



SCHAEFFER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of temperature at 125% load
Potential 110-111 volts
Power Factor .99
Frequency 60 ~

Schaeffer Induction Wattmeter Type E.

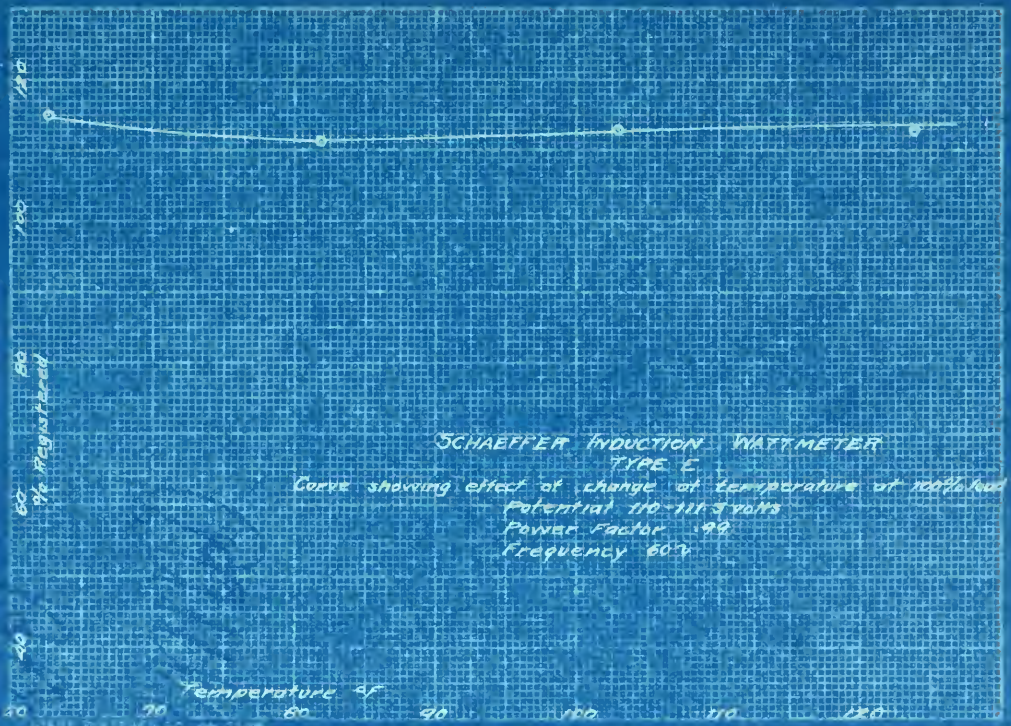
Data showing the effect of change of temperature at 100% load.

Potential = 110 - 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
10.2	62.6	115.0
10.3	81.8	111.0
10.3	102.9	112.9
10.3	123.8	112.9



SCHAEFFER INDUCTION WATTMETER
TYPE C
Curve showing effect of change of temperature at 100% load
Potential 110-111 Volts
Power Factor .99
Frequency 60~

Schaeffer Induction Wattmeter Type E.

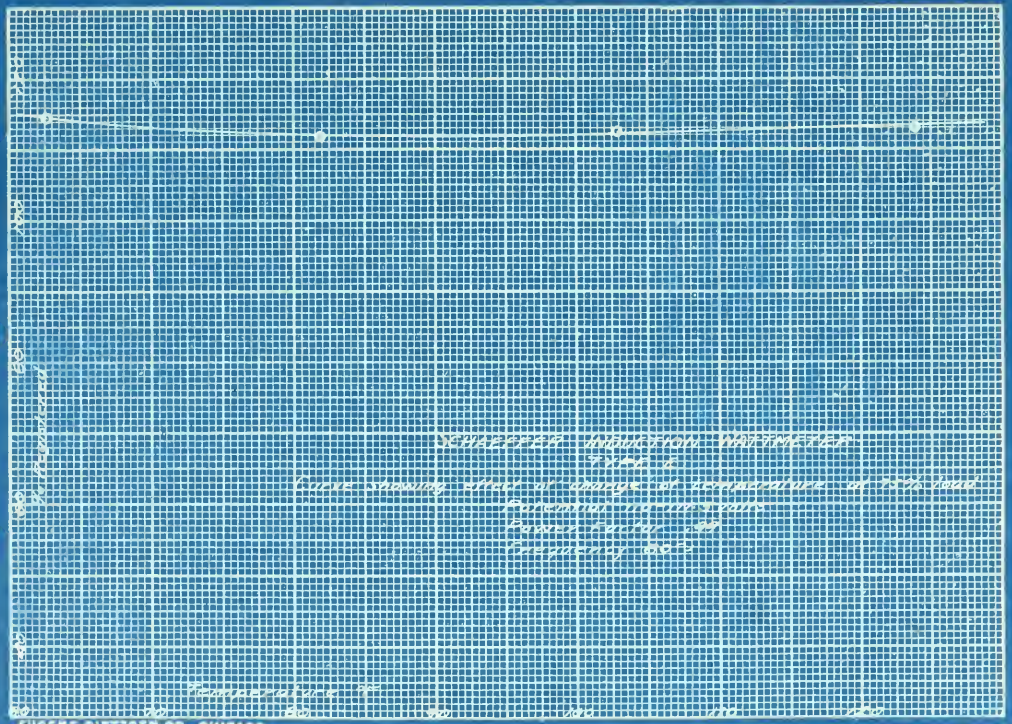
Data showing the effect of change of temperature at 75% load.

Potential = 110 - 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
7.53	62.6	114.5
7.5	81.8	111.8
7.5	102.9	112.2
7.5	123.8	113.0



EUGENE DIETZGEN CO., CHICAGO.

Schaeffer Induction Wattmeter Type E.

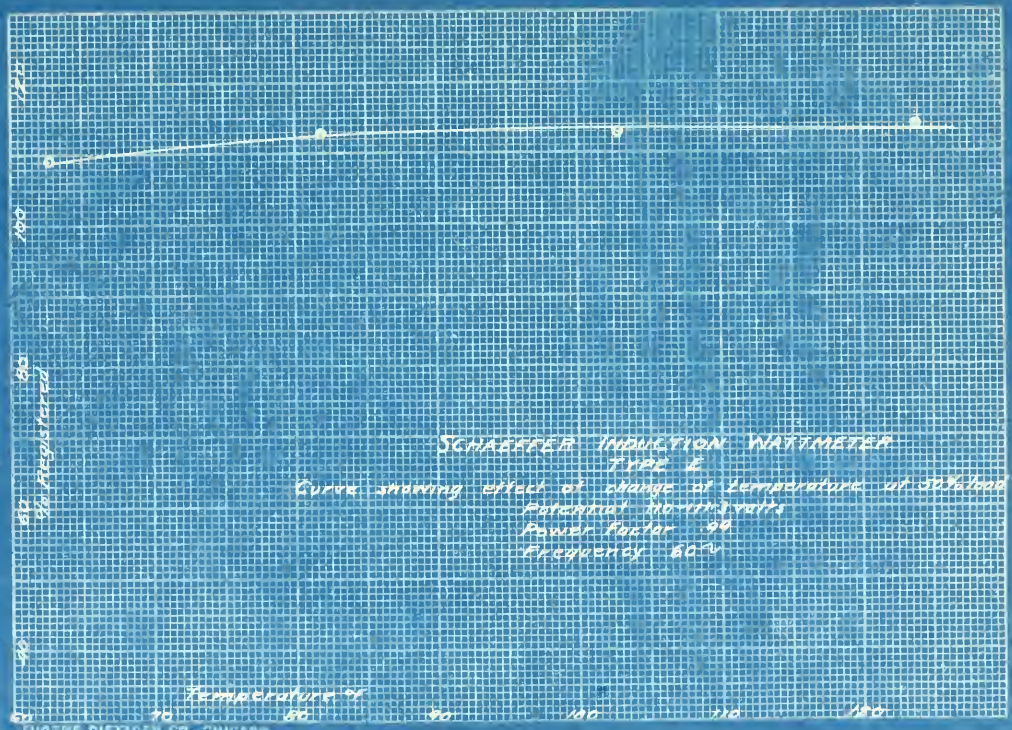
Data showing the effect of change of temperature at 50% load.

Potential = 110 - 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
5.0	62.6	109.0
5.25	81.8	112.9
5.25	102.9	113.0
5.25	123.8	114.0


Per Cent Registration
Temperature °F
SCHAEFER INDUCTION WATTMETER
TYPE E
Curve showing effect of change of temperature on 50% load
Potential 110 Volts
Power Factor 90
Frequency 60 ~
EUGENE DIETZGEN CO., CHICAGO.

Schaeffer Induction Wattmeter Type E.

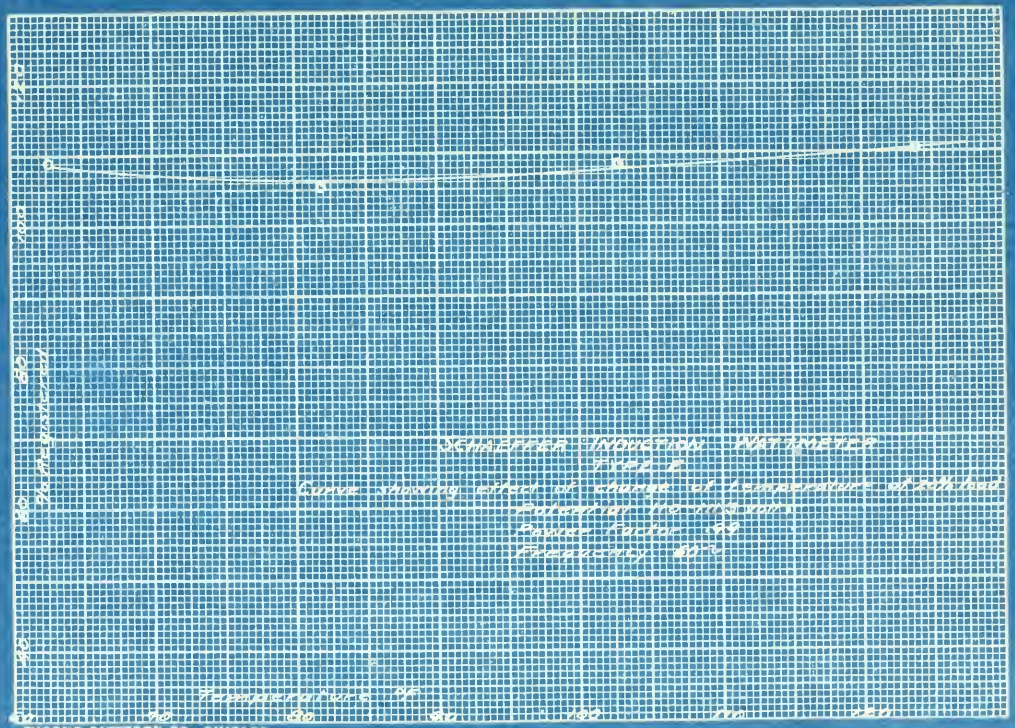
Data showing the effect of change of temperature at 20% load.

Potential = 110 - 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
2.00	62.6	109.0
2.00	81.8	105.8
2.00	102.9	108.7
2.00	123.8	110.5



EUGENE DIETZGEN CO., CHICAGO.

Schaeffer Induction Wattmeter Type E.

Shunt Loss = 1.9 watts at 110 volts and 60 cycles per second.

Series Loss = 1.7 watts at 10 amperes and 60 cycles/second.

Determination of Flux Quadrature

Amperes	Volts	Watts	Cos θ	θ
10.0	103.5	11.0	.0106	89° 23' 33"

WESTINGHOUSE
INDUCTION WATTMETER

TYPE C

STYLE X 138803

NO 568582

Westinghouse Induction Wattmeter Type C.

Data showing the effect of change of load at normal voltage and frequency, and unity power factor.

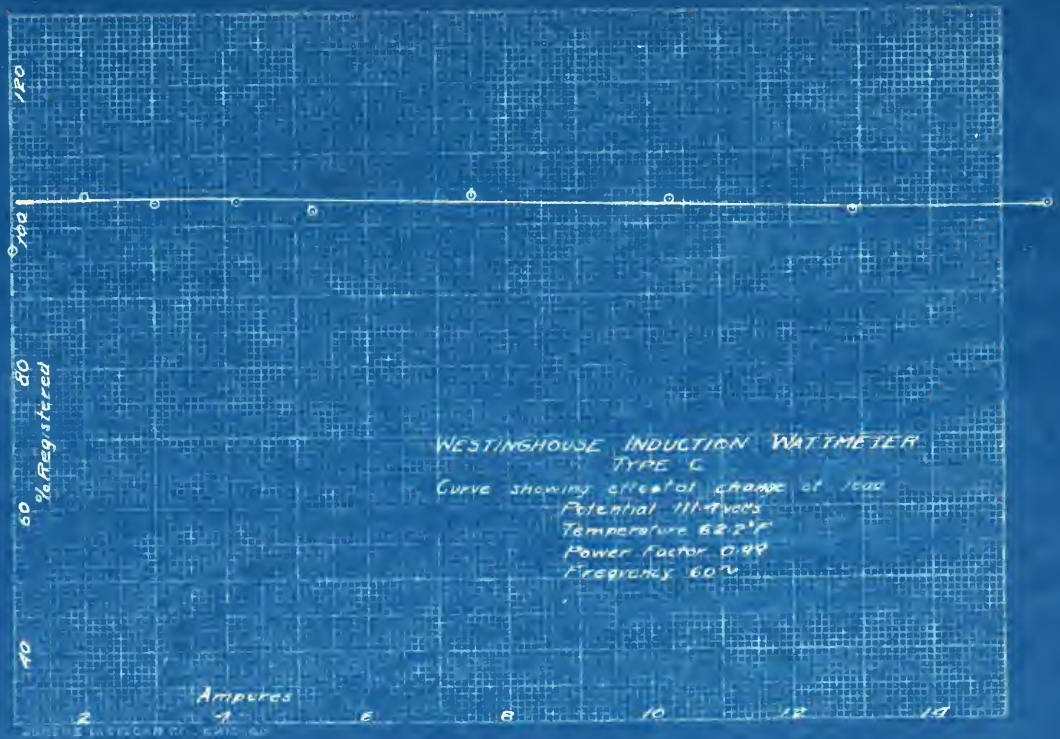
Potential = 111.4 volts

Temperature = 62.2°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	142.4	146.0	102.6
12.9	118.5	120.6	101.9
10.3	92.8	96.0	103.3
7.5	69.3	72.0	104.0
5.25	46.5	47.3	101.9
4.18	36.75	38.0	103.3
3.02	29.7	30.65	103.2
2.00	19.2	20.0	104.1
0.98	9.64	9.33	97.0



WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of load
Potential 111.9 volts
Temperature 62.2°F
Power factor 0.99
Frequency 60 ~

Westinghouse Induction Wattmeter Type C.

Data showing the effect of change of load at normal frequency, unity power factor, and 75% normal voltage.

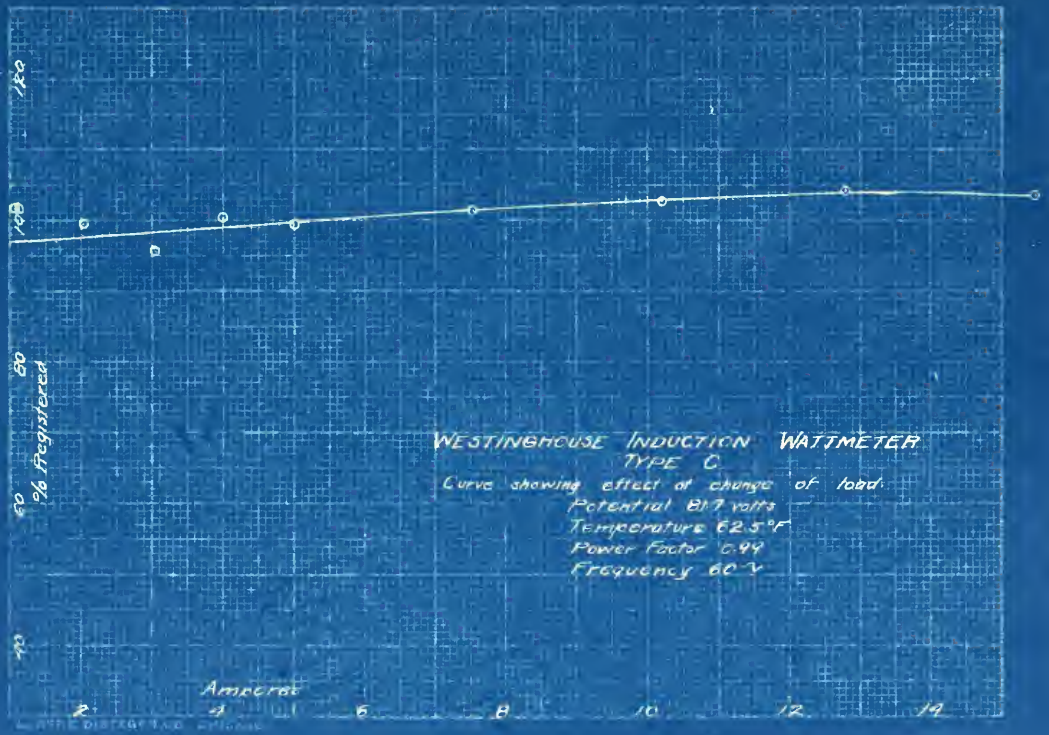
Potential = 81.7 volts

Temperature = 62.5°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.45	102.8	106.0	103.1
12.8	85.0	88.6	104.1
10.2	68.2	70.0	102.9
7.53	51.4	52.0	101.1
5.0	35.6	35.3	99.3
4.0	27.3	27.3	100.0
3.03	21.6	20.65	95.6
2.02	14.7	14.65	99.6
1.05	7.2	7.32	101.6



WESTINGHOUSE INDUCTION WATTMETER
TYPE C.
Curve showing effect of change of load.
Potential 81.7 volts
Temperature 62.5°F
Power Factor 0.99
Frequency 60~

Westinghouse Induction Wattmeter Type C.

Data showing the effect of change of load at normal frequency, unity power factor, and 90% normal voltage.

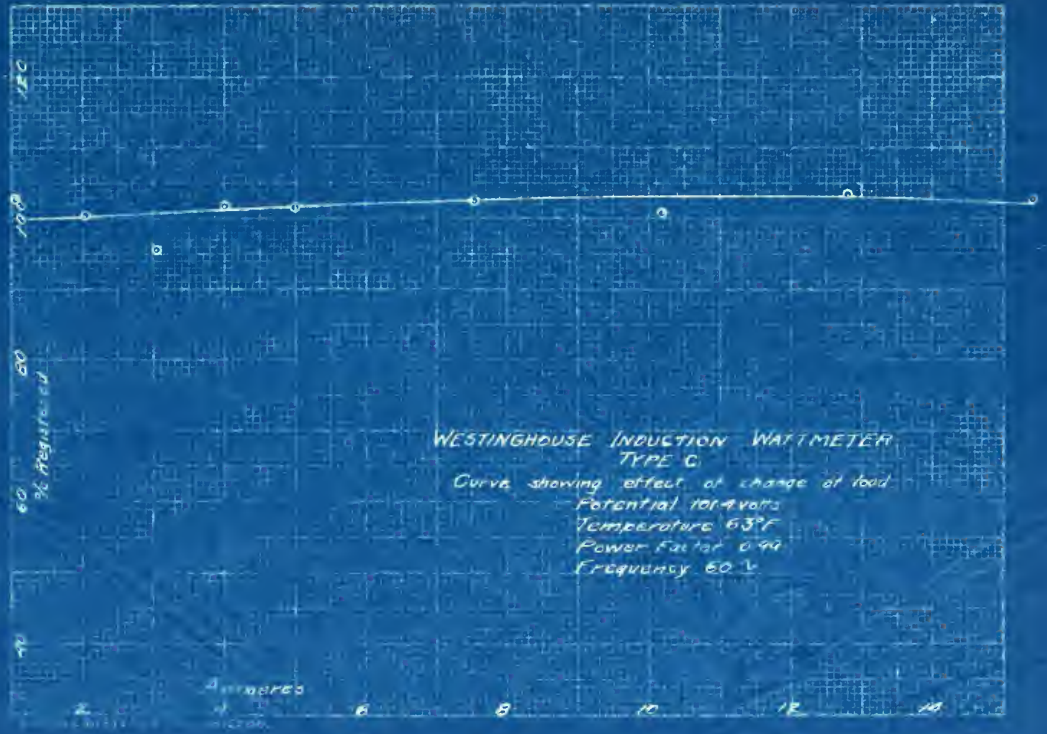
Potential = 101.4 volts

Temperature = 63.0°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.45	129.0	132.6	102.8
12.8	107.0	110.6	103.3
10.2	85.9	86.6	100.9
7.53	62.5	64.0	102.3
5.0	44.0	44.6	101.3
4.0	33.4	34.0	101.8
3.03	25.8	24.65	95.6
2.02	19.95	20.0	100.2
1.05	8.43	8.66	102.9


WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of load
Potential 101.4 volts
Temperature 63°F
Power Factor 0.99
Frequency 60 ~
% Registration
Amperes
100
60
2
6
8
10
12
14

Westinghouse Induction Wattmeter Type C.

Data showing the effect of change of load at normal frequency, unity power factor, and 110% normal voltage.

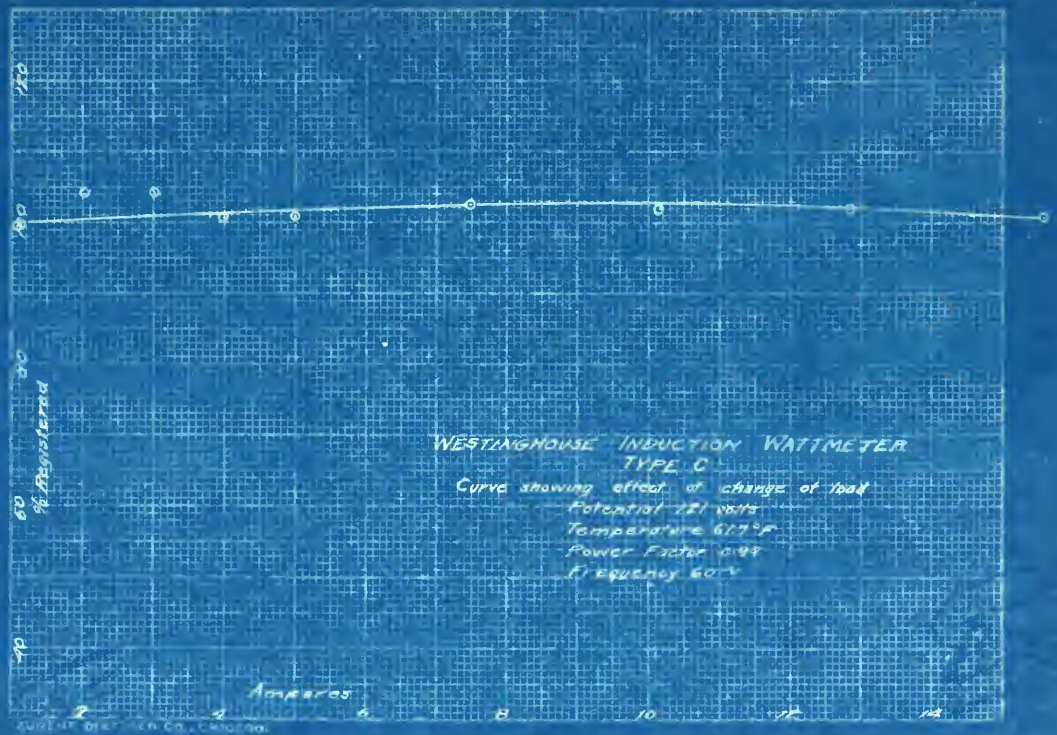
Potential = 121 volts

Temperature = 61.7°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	157.2	158.0	100.5
12.85	129.3	132.0	102.0
10.16	101.2	103.2	102.0
7.48	75.4	77.3	102.5
5.0	50.2	50.6	100.9
4.03	41.1	41.3	100.6
3.01	31.25	32.6	104.1
2.02	20.5	21.3	104.0
1.08	9.4	9.34	99.4



WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of load
Potential 121 volts
Temperature 61.7°F
Power Factor 0.99
Frequency 60 ~

BLUE PRINT PROCESS CO., CHICAGO

Westinghouse Induction Wattmeter Type C.

Data showing the effect of change of load at normal voltage, unity power factor, and 66% normal frequency.

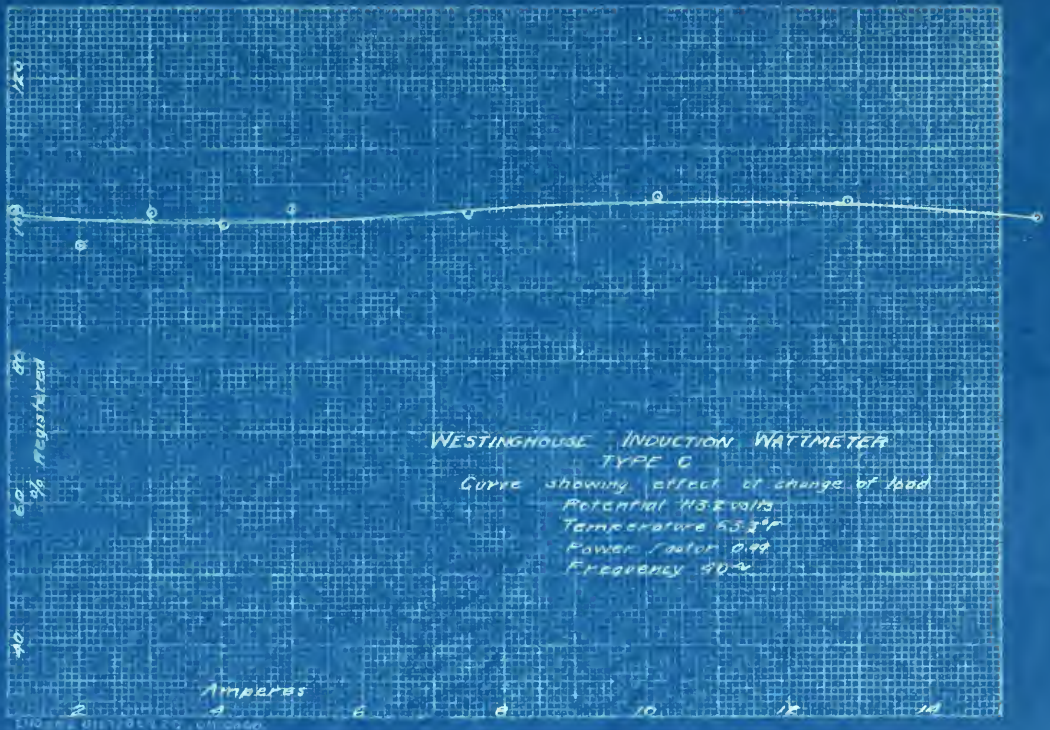
Potential = 113.2 volts

Temperature = 63.3°F.

Power factor = .99

Frequency = 40 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	143.4	144.0	100.2
12.85	117.2	120.6	102.8
10.16	92.2	95.4	103.2
7.48	69.6	70.0	100.3
5.0	45.9	46.6	101.4
4.03	37.0	36.7	99.2
3.01	27.7	28.0	101.0
2.02	17.9	17.3	96.6
1.08	7.9	8.0	101.2



WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of load
Potential 113.2 volts
Temperature 63.1°F
Power factor 0.99
Frequency 60~

ENGRG DIST. DEPT. CHICAGO.

Westinghouse Induction Wattmeter Type C.

Data showing the effect of change of load at normal voltage, unity power factor, and 133⅓% normal frequency.

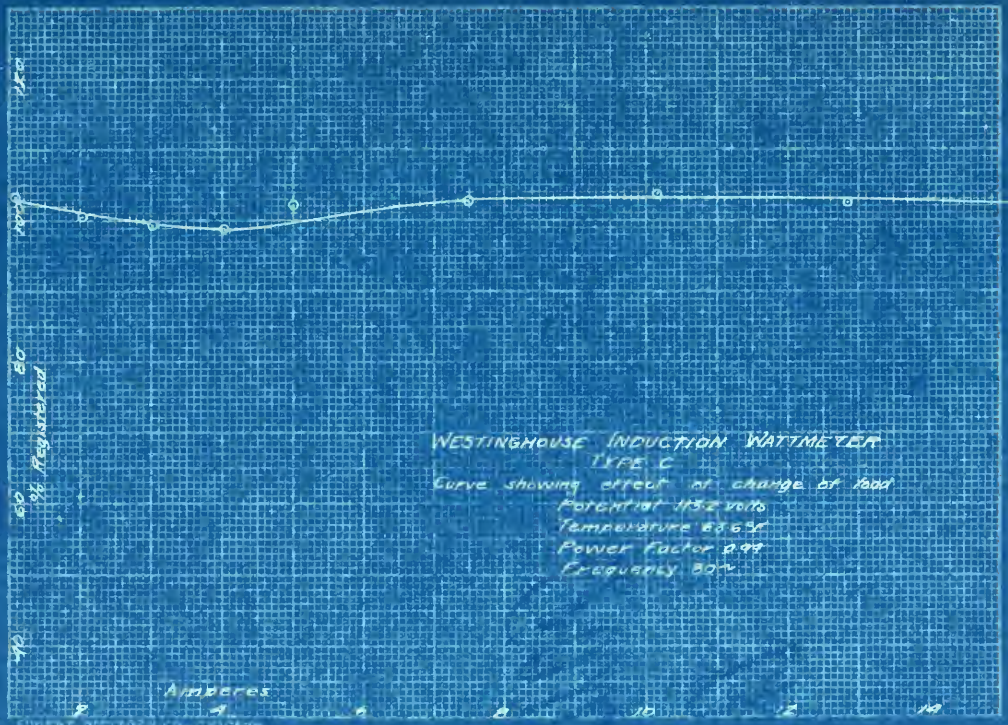
Potential = 113.2 volts

Temperature = 63.6°F.

Power factor = .99

Frequency = 80 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	142.2	143.3	100.8
12.85	117.9	120.6	102.3
10.16	92.5	96.0	103.9
7.48	68.75	70.6	102.8
5.0	49.1	50.0	101.9
4.03	37.2	36.7	98.8
3.01	28.26	28.0	99.2
2.02	19.2	19.3	100.5
1.08	9.69	10.0	103.2


WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of load
Potential 115.2 volts
Temperature 83.6°F
Power Factor 0.99
Frequency 60~
Amperes
2
4
6
8
10
12
14
Per cent of normal reading

Westinghouse Induction Wattmeter Type C.

Data showing the effect of change of load at normal voltage and frequency, and 75% power factor .

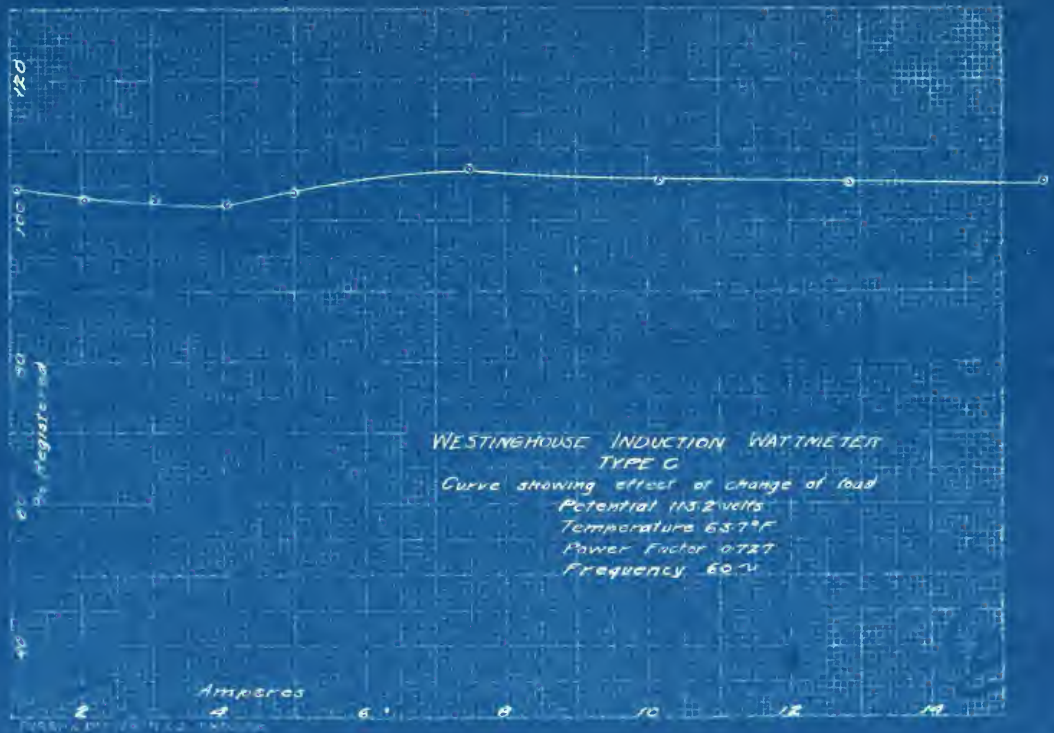
Potential = 113.2 volts

Temperature = 63.7°F.

Power factor = .727

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	101.1	106.7	105.2
12.85	84.9	89.4	105.2
10.16	67.5	71.3	105.8
7.48	52.2	56.0	107.2
5.0	34.0	35.3	104.0
4.03	28.6	29.3	102.4
3.01	21.95	22.6	103.0
2.02	14.18	14.6	103.0
1.08	7.55	8.0	104.7



WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of load
Potential 113.2 volts
Temperature 63.7°F
Power Factor 0727
Frequency 60.4

Westinghouse Induction Wattmeter Type C.

Data showing the effect of change of load at normal voltage and frequency, and 50% power factor.

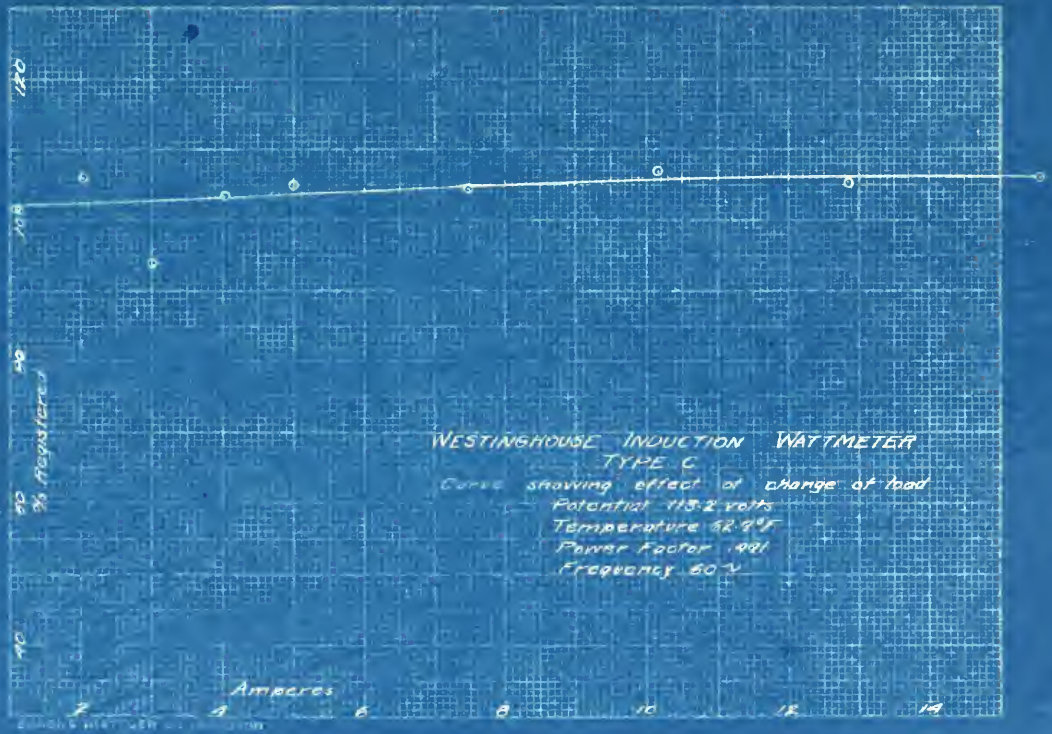
Potential = 113.2 volts

Temperature = 62.9°F.

Power factor = .491

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.53	69.1	73.3	106.0
12.85	57.0	60.0	105.2
10.16	46.2	49.4	106.9
7.48	34.5	36.0	104.3
5.0	22.9	24.0	104.9
4.03	18.7	19.3	103.2
3.01	14.2	13.3	93.7
2.02	9.42	10.0	106.0
1.08	5.22	5.3	101.5


120
100
80
% Registers
Amperes
2
4
6
8
10
12
14
WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of load
Potential 113.2 volts
Temperature 82.2°F
Power Factor .991
Frequency 60 ~

Westinghouse Induction Wattmeter Type C.

Data showing the effect of change of load at normal voltage and frequency, and unity power factor.

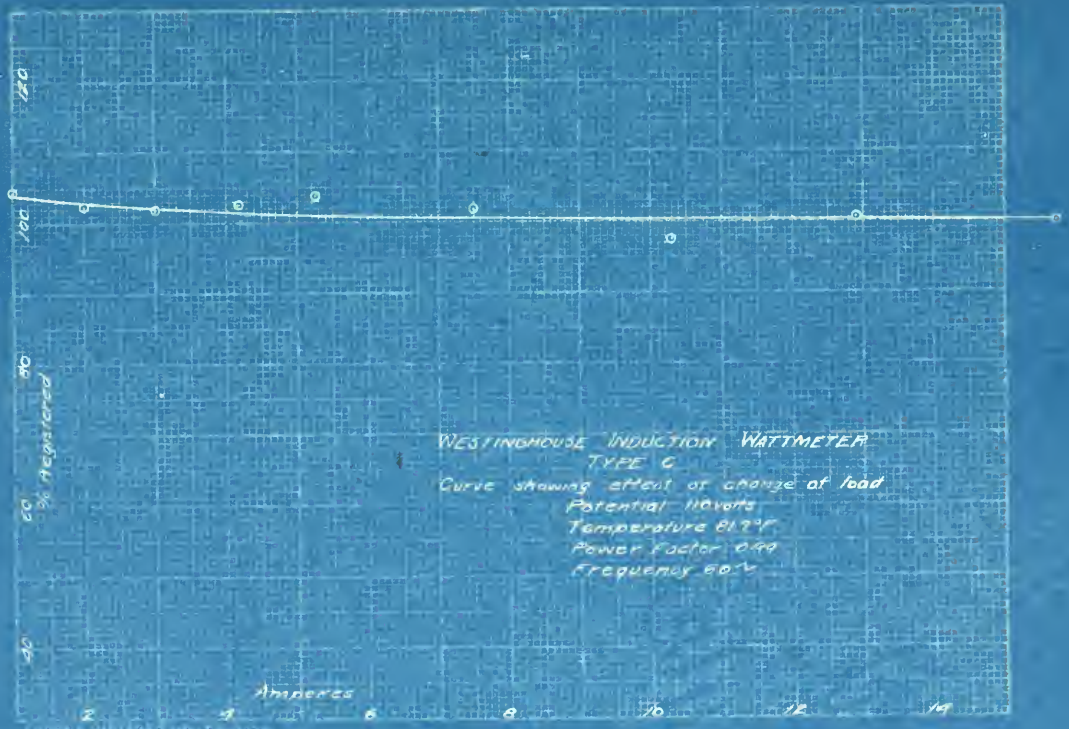
Potential = 110 volts

Temperature = 81.7°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	138.2	138.0	99.8
12.9	116.0	116.6	100.5
10.3	92.1	90.0	97.6
7.5	66.9	68.0	101.7
5.25	44.3	46.0	103.9
4.18	37.0	38.0	102.5
3.02	26.8	27.3	101.9
2.00	17.6	18.0	102.2
0.98	8.3	8.66	104.2


110
100
90
80
% Registered
Amperes
2
4
6
8
10
12
14
WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of load
Potential 110 volts
Temperature 81.2°F
Power Factor 0.99
Frequency 60~

Westinghouse Induction Wattmeter Type C.

Data showing the effect of change of load at normal voltage and frequency, and unity power factor.

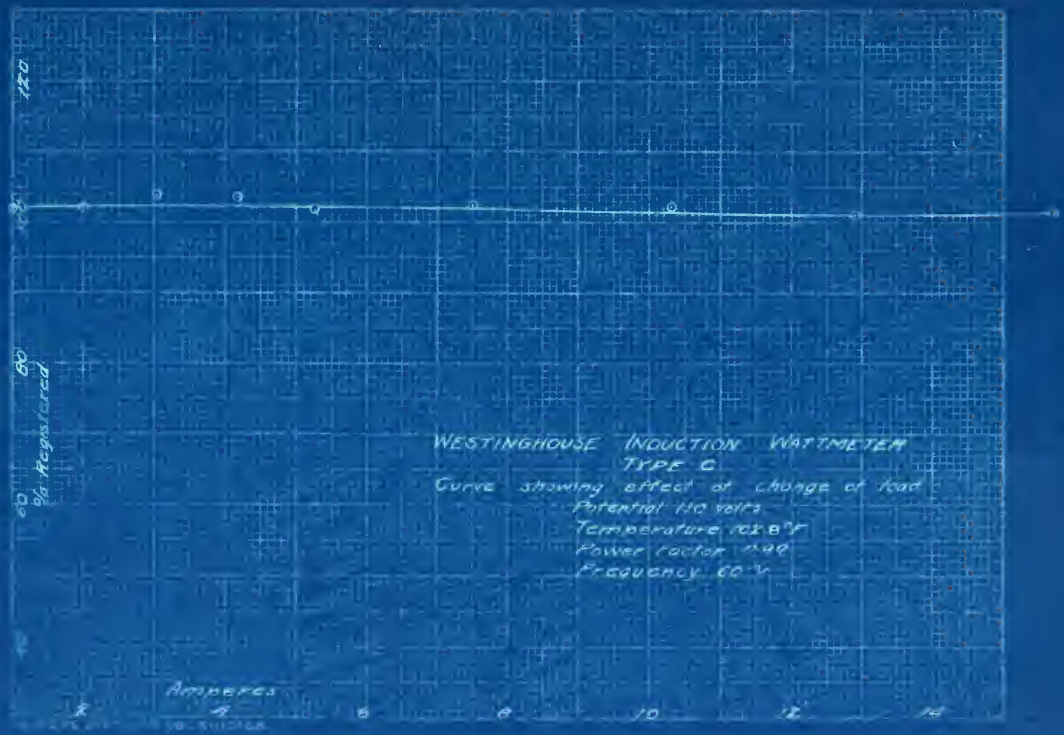
Potential = 110 volts

Temperature = 102.8°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	138.0	140.0	101.3
12.9	116.0	117.2	101.0
10.3	91.2	93.3	102.3
7.5	54.2	55.3	102.2
5.25	45.9	46.6	101.6
4.18	38.0	39.3	103.5
3.02	27.0	28.0	103.9
2.00	18.3	18.7	102.0
0.98	9.1	9.3	102.0



WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of load
Potential 110 volts
Temperature 103.8°F
Power factor 1.00
Frequency 60 ~

Westinghouse Induction Wattmeter Type C.

Data showing the effect of change of load at normal voltage and frequency, and unity power factor.

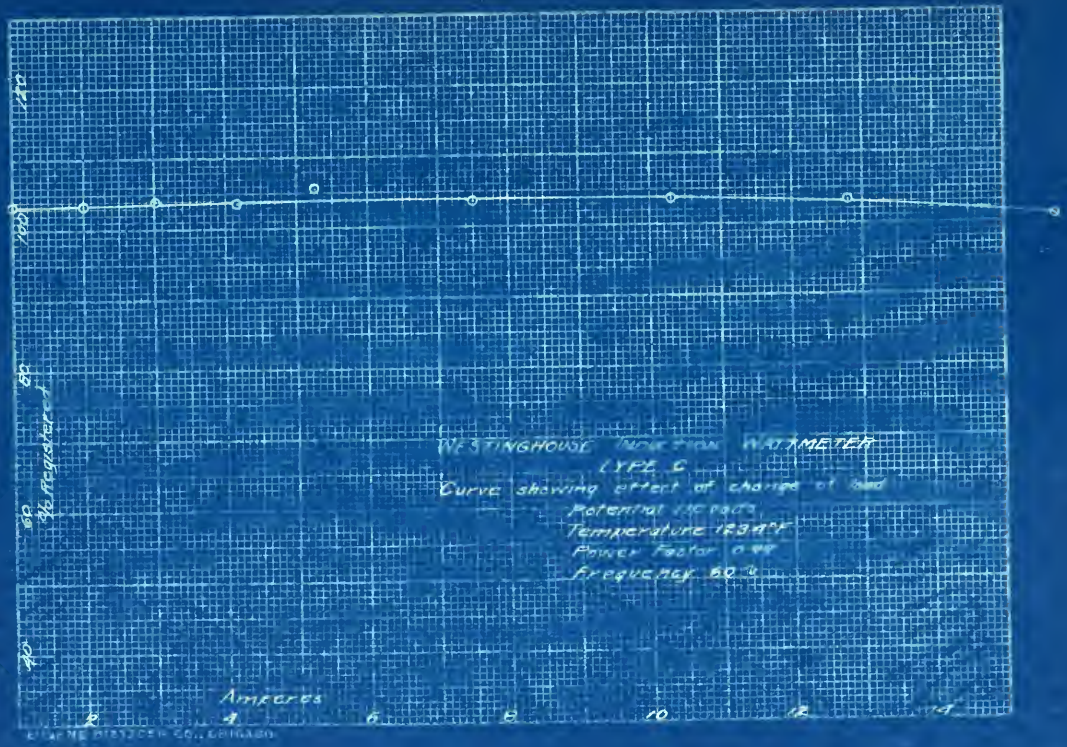
Potential = 110 volts

Temperature = 123.4°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	139.2	140.0	100.6
12.8	115.6	119.2	103.2
10.3	91.9	95.2	103.8
7.5	67.6	70.0	103.8
5.25	44.9	47.3	105.5
4.18	36.7	38.0	103.6
3.02	27.6	28.7	104.0
2.00	18.1	18.7	103.2
0.98	9.02	9.3	103.1


WESTINGHOUSE
TYPE C
WATTMETER
Curve showing effect of change of load
Potential 115 volts
Temperature 123.8°F
Power Factor 0.98
Frequency 60 ~
Amperes
2
4
6
8
10
12
14

Westinghouse Induction Wattmeter Type C.

Data showing the effect of change of voltage at 150% load.

Temperature = 61.7 - 63.0°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
15.45	81.7	103.1
15.45	101.4	102.8
15.6	111.4	102.6
15.53	121.0	100.5

DIAGRAM SHOWING RELATION OF TEMPERATURE AND RELATIVE HUMIDITY TO COMFORT

Prepared by Committee on Ventilation of the American Society of Heating and Ventilating Engineers

Reprinted from Report of Committee on Ventilation, 1915

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Reprinted from Report of Committee on Standards, 1923

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Westinghouse Induction Wattmeter Type C.

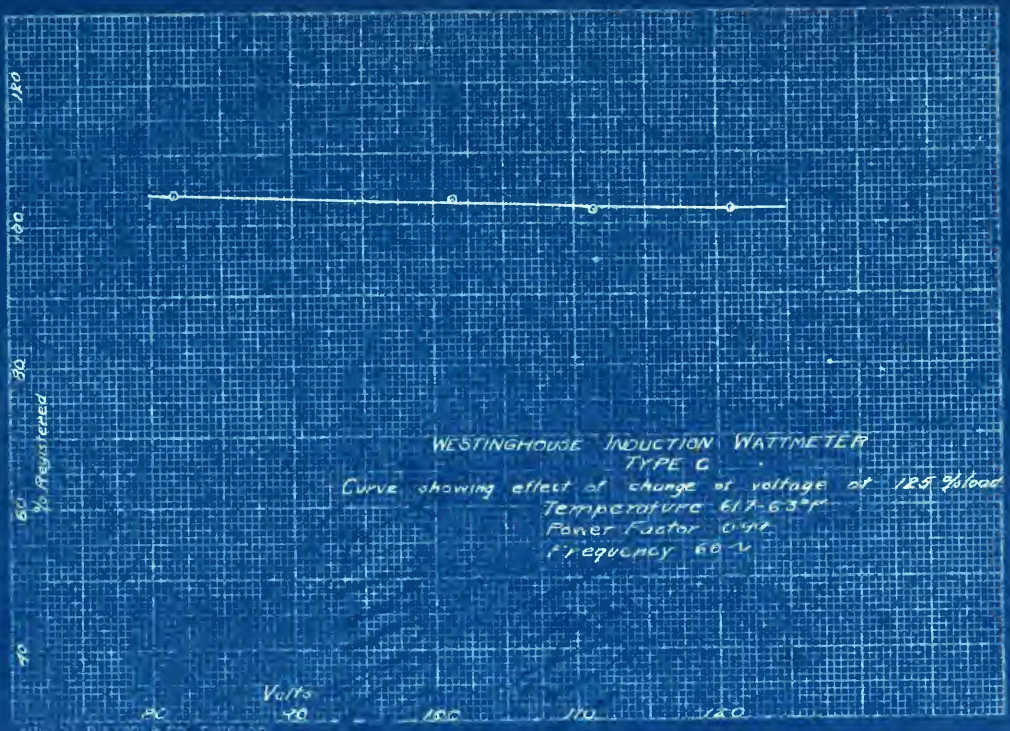
Data showing the effect of change of voltage at 125% load.

Temperature = 61.7 - 63.0°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
12.8	81.7	104.1
12.8	101.4	103.3
12.9	111.4	101.9
12.85	121.0	102.0



WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of voltage at 125% load
Temperature 61.7-63°F
Power Factor Unity
Frequency 60 ~

Westinghouse Induction Wattmeter Type C.

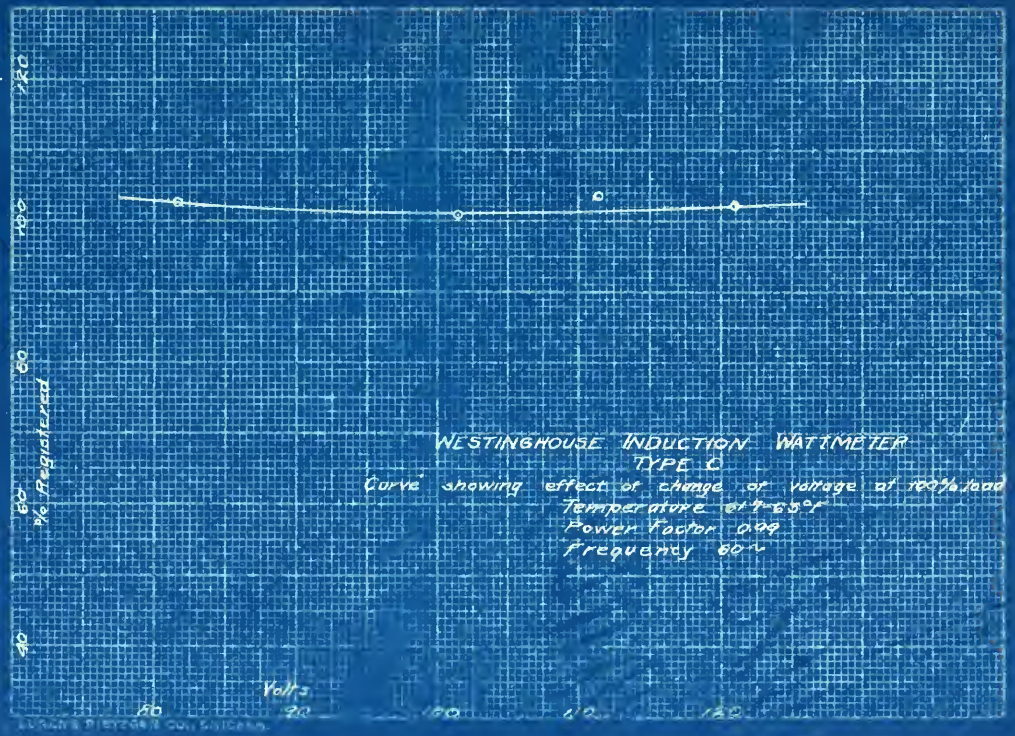
Data showing the effect of change of voltage at 100% load.

Temperature = 71.7 - 63.0°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
10.2	81.7	102.9
10.2	101.4	100.9
10.3	111.4	103.3
10.16	121.0	102.0



WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of voltage at 100% load
Temperature 61°-65°F
Power Factor 0.99
Frequency 60~

Westinghouse Induction Wattmeter Type C, .

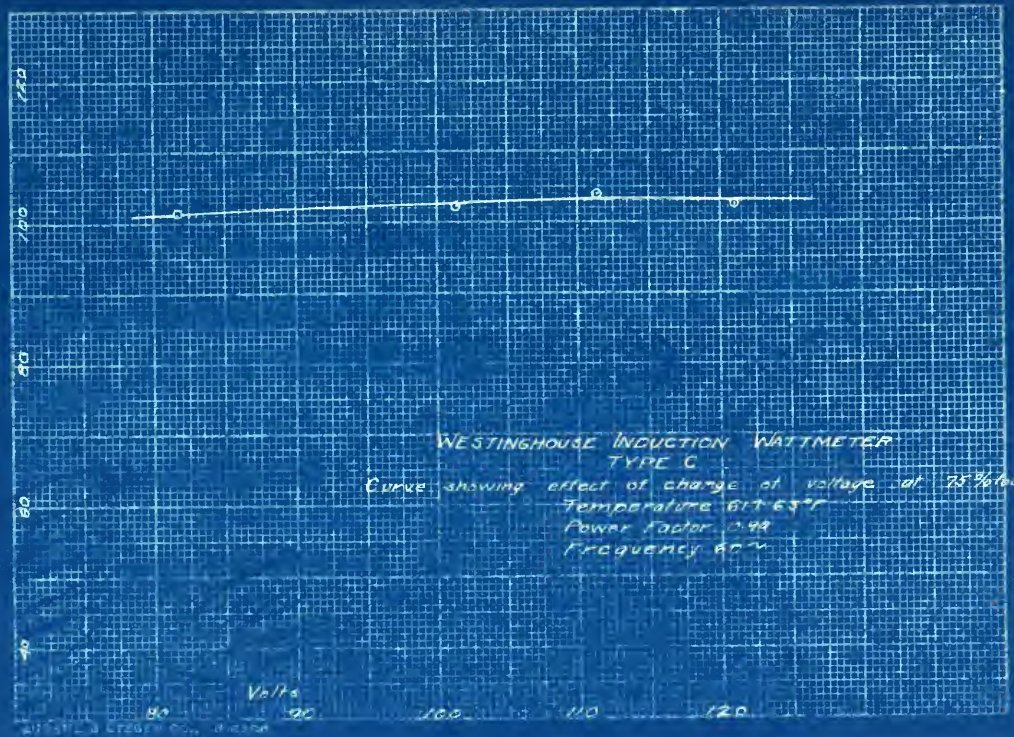
Data showing the effect of change of voltage at 75% load.

Temperature = 61,7 - 63.0°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
7.53	81.7	101.1
7.53	101.4	102.3
7.5	111.4	104.0
7.48	121.0	102.5



WESTINGHOUSE INDUCTION WATTMETER
TYPE C

Curve showing effect of change of voltage at 75% load
Temperature 61°F 63°F
Power Factor .99
Frequency 60 ~

Westinghouse Induction Wattmeter Type C.

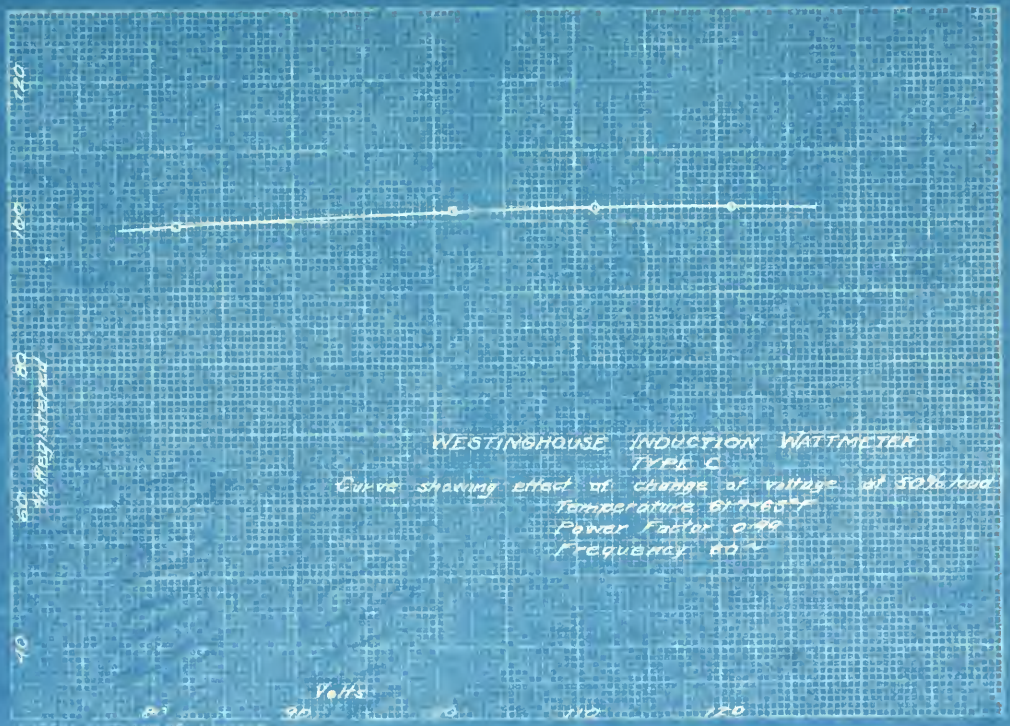
Data showing the effect of change of voltage at 50% load.

Temperature = 61.7 - 63.0°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
5.0	81.7	99.3
5.0	101.4	101.3
5.25	111.4	101.9
5.00	121.0	100.9



WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of voltage at 50% load
Temperature 81°F
Power Factor 0.79
Frequency 60 ~

Westinghouse Induction Wattmeter Type C.

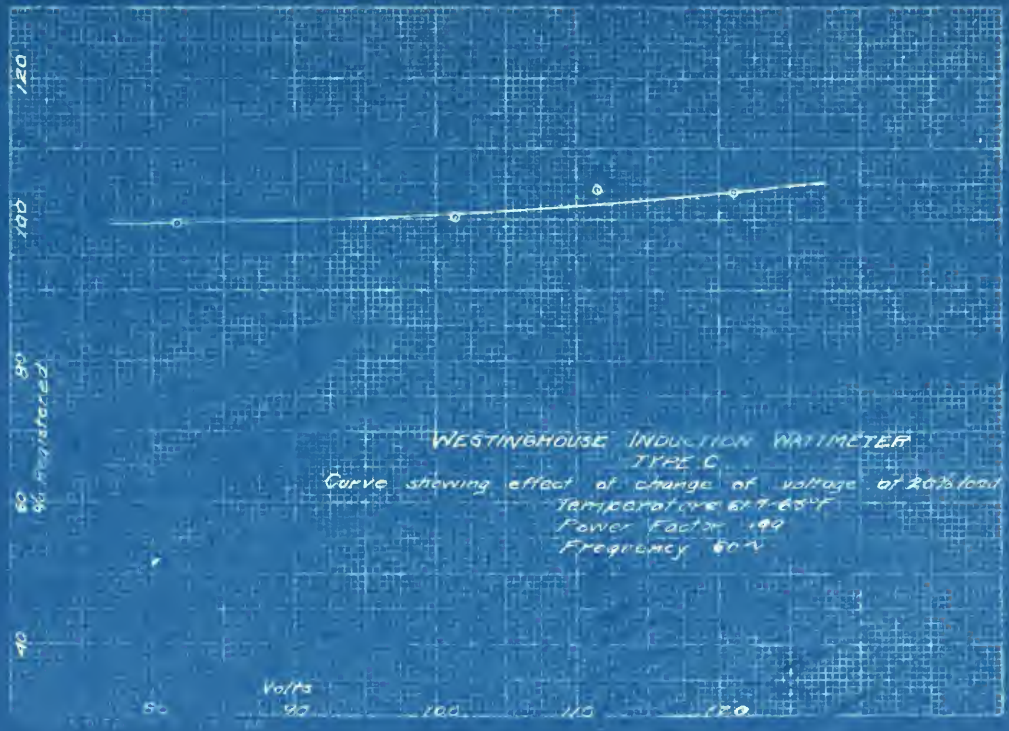
Data showing the effect of change of voltage at 20% load.

Temperature = 61.7 - 63.0°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
2.02	81.7	99.6
2.02	101.4	100.2
2.00	111.4	104.1
2.02	121.0	104.0



WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve shewing effect of change of voltage at 20% load
Temperature 67-68°F
Power Factor 1.00
Frequency 60~

Westinghouse Induction Wattmeter Type C.

Data showing the effect ofchange of frequency at 150% load.

Potential = 111.4 - 113.2 volts

Temperature = 62.2 - 63.6°F.

Power factor.= .99

Current	Frequency	% Registered
15.53	40	100.2
15.6	60	102.6
15.53	80	100.8

Westinghouse Induction Wattmeter Type C.

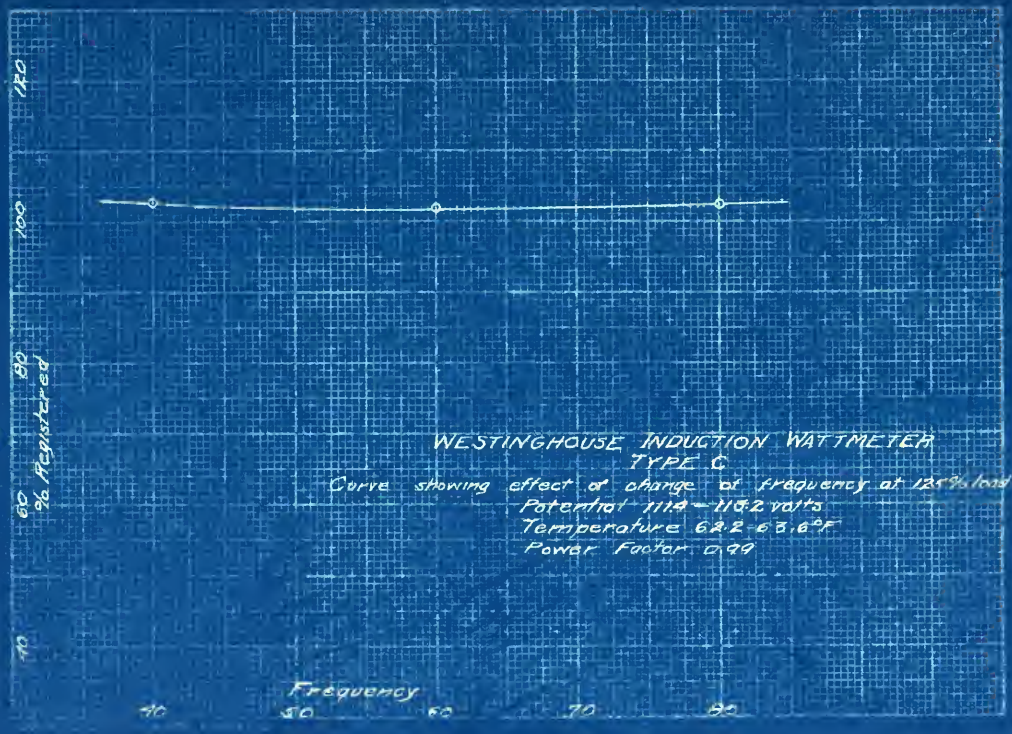
Data showing the effect of change of frequency at 125% load.

Potential = 111.4 - 113.2 volts

Temperature = 62.2 - 63.6°F.

Power factor = .99

Current	Frequency	% Registered
12.85	40	102.8
12.9	60	101.9
12.85	80	102.3


WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of frequency at 12.5% load
Potential 111.9 – 112.2 volts
Temperature 62.2 – 63.6°F
Power Factor 0.99
% Registered
110
100
90
80
70
Frequency
40
50
60
70
80

Westinghouse Induction Wattmeter TypeC.

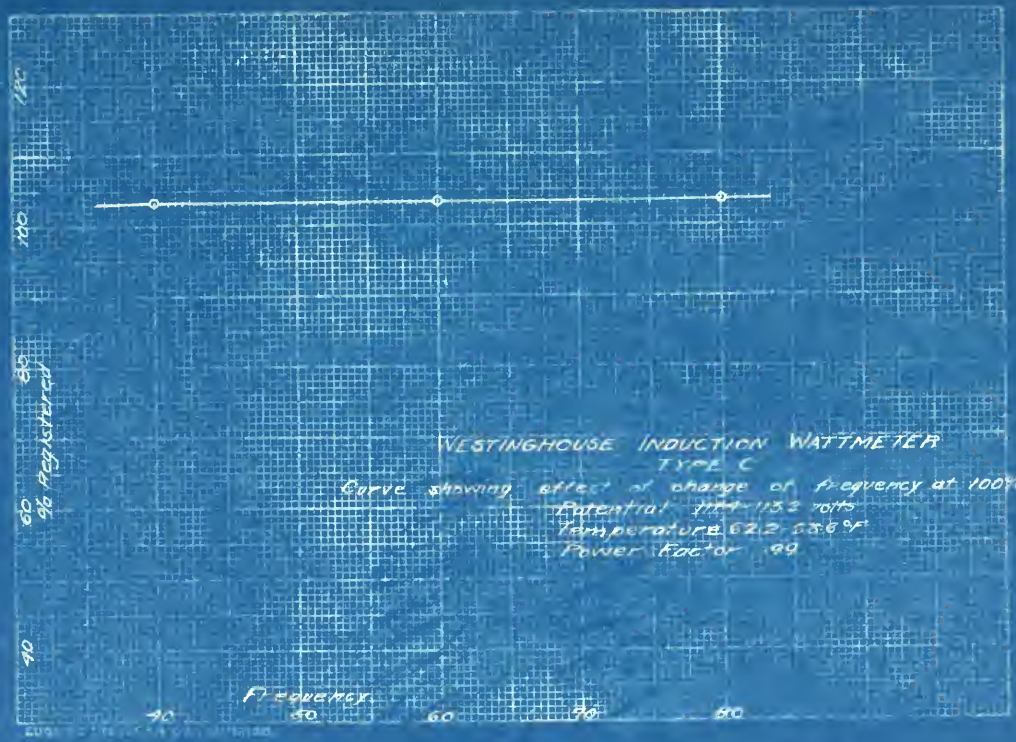
Data showing the effect of change of frequency at 100% load.

Potential = 111.4 - 113.2 volts

Temperature = 62.2 - 63.6°F.

Power factor = .99

Current	Frequency	Registered %
10.16	40	103.2
10.3	60	103.3
10.16	80	103.9


WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of frequency at 100% load
Potential 115 volts
Temperature 62.2 F
Power Factor .99
% Registered
Frequency
40
50
60
70
80
90
100
110

Westinghouse Induction Wattmeter Type C.

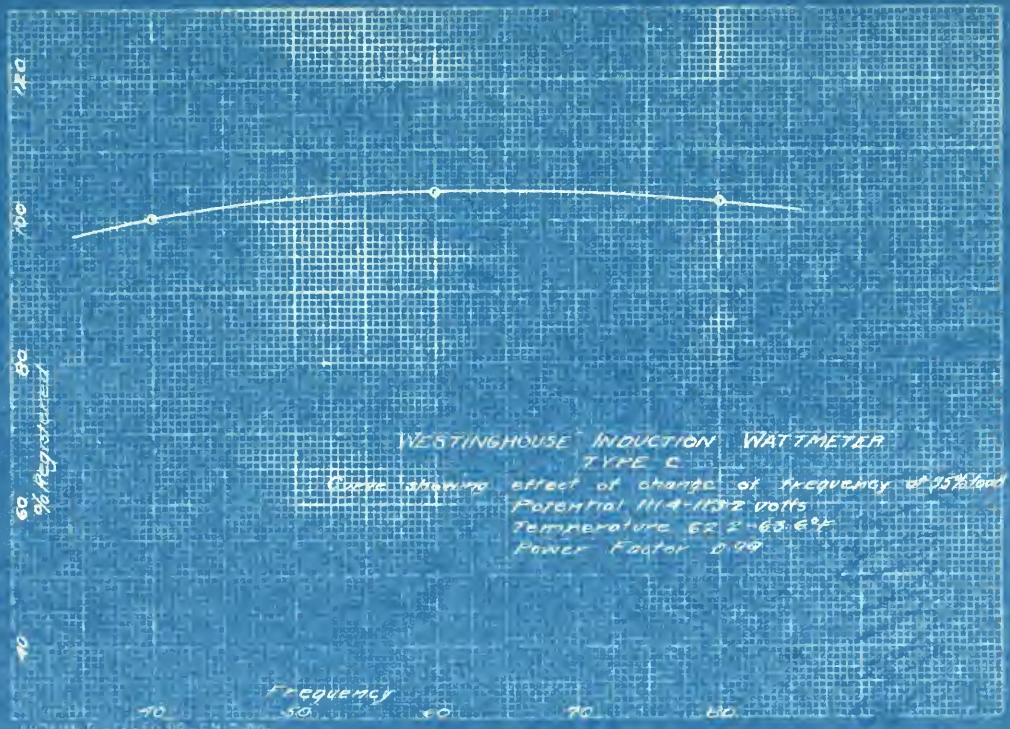
Data showing the effect of change of frequency at 75% load.

Potential = 111.4 - 113.2 volts

Temperature = 62.2 - 63.6°F.

Power factor = .99

Currant	Frequency	% Registered
7.48	40	100.3
7.5	60	104.0
7.48	80	102.8


WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of frequency at 75% load
Potential 111.4-112 volts
Temperature 62.2°-63.6°F.
Power Factor 1.00
Per Cent
100
99
98
Frequency
50
60
70

Westinghouse Induction Wattmeter Type C.

Data showing the effect of change of frequency at 50% load.

Potential = 111.4 - 113.2 volts

Temperature = 62.2 - 63.6°F

Power factor = .99

Current	Frequency	% Registered
5.0	40	101.4
5.25	60	101.9
5.0	80	101.9

Registered
80
100
120

Westinghouse Induction Wattmeter Type C.

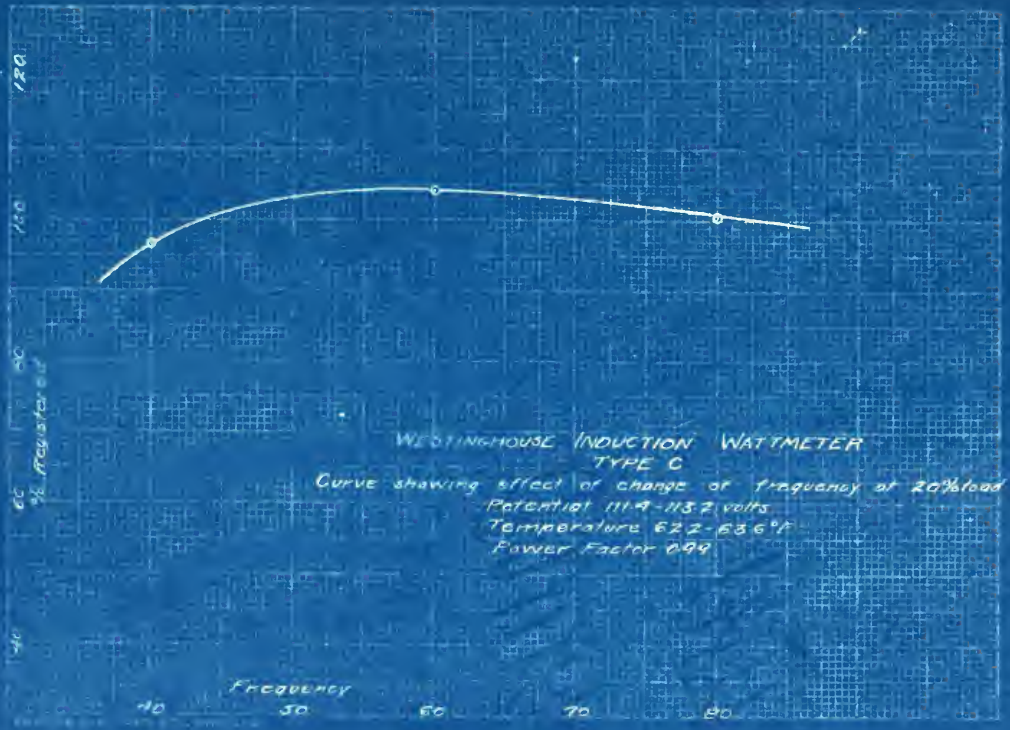
Data showing the effect of change of frequency at 20% load.

Potential = 111.4 - 113.2 volts

Temperature = 62.2 - 63.6°F.

Power factor = .99

Current	Frequency	% Registered
2.02	40	96.6
2.00	60	104.1
2.02	80	100.5



WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of frequency at 20% load
Potential 111.9-113.7 volts
Temperature 62.2-63.6°F
Power Factor 0.99

Westinghouse Induction Wattmeter Type C.

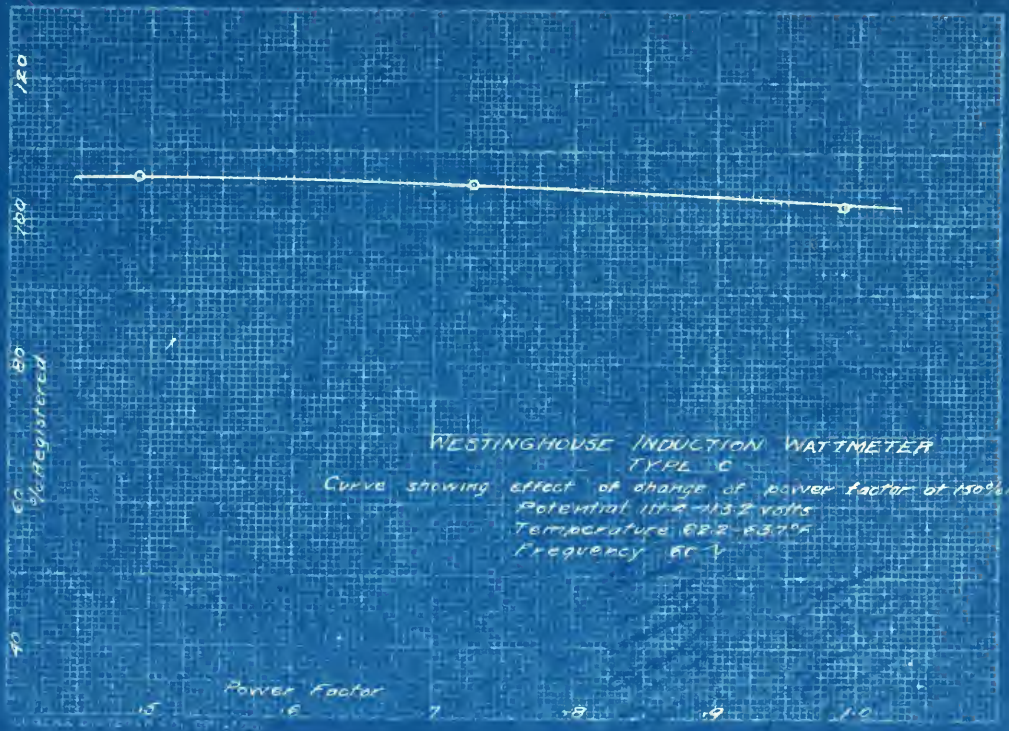
Data showing the effect of change of power factor at 150% load.

Potential = 111.4 - 113.2 volts

Temperature = 62.2 - 63.7°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
15.53	.491	106.0
15.53	.727	105.2
15.6	.99	102.6



WESTINGHOUSE INDUCTION WATTMETER
TYPE C

Curve showing effect of change of power factor at 150% load
Potential 117.2-113.2 volts
Temperature 62.2-63.7°F
Frequency 60 ~

Westinghouse Induction Wattmeter Type C,

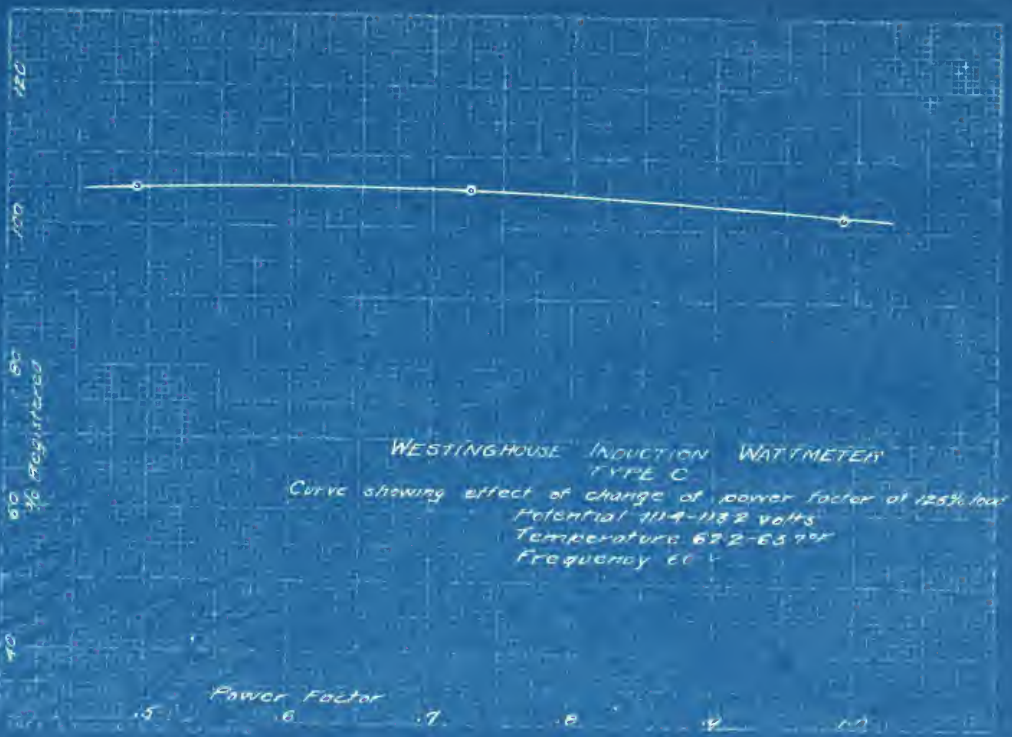
Data showing the effect of change of power factor at 125% load.

Potential = 111.4 - 113.2 volts

Temperature = 62.2 - 63.7°F.

Frequency = 60 cycles/sec.

Current	Power factor	Registered %
12.85	.491	105.2
12.85	.727	105.2
12.9	.99	101.9



WESTINGHOUSE INDUCTION WATTMETER
TYPE C

Curve showing effect of change of power factor at 125% load
Potential 1114-1132 volts
Temperature 62.2-63.7°F
Frequency 60 ~

Westinghouse Induction Wattmeter Type C.

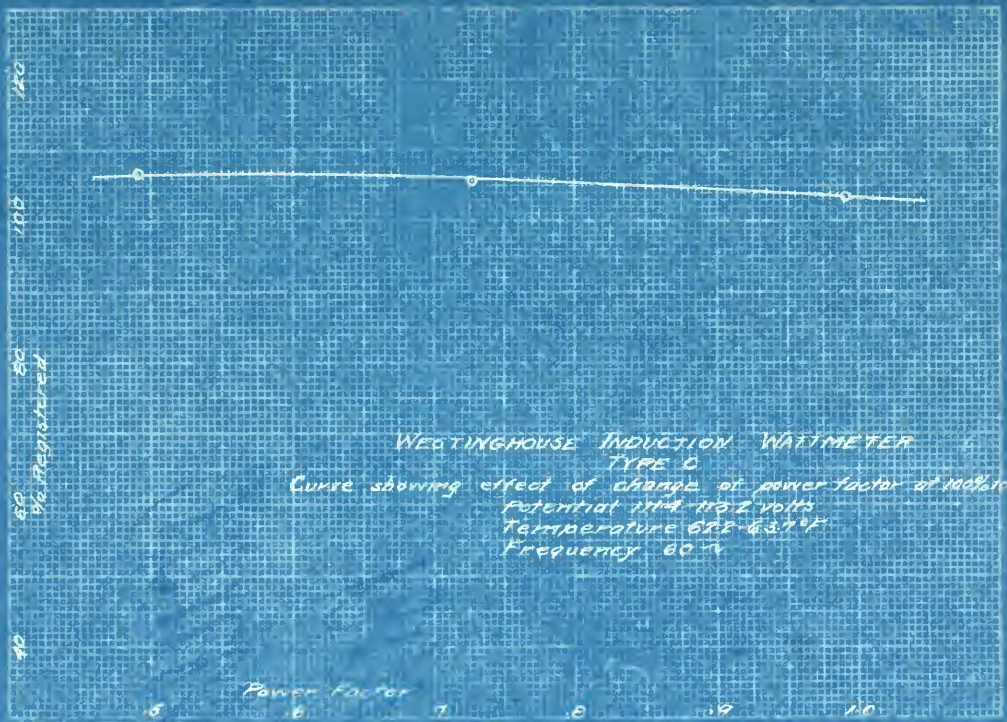
Data showing the effect of change of power factor at 100% load.

Potential = 111.4 - 113.2 volts

Temperature = 62.2 -63.7°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
10.16	.491	106.9
10.16	.727	105.8
10.3	.99	103.3



WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of power factor at rated load
Potential 114.4 to 117 volts
Temperature 62.2-63.7° F
Frequency 60 ~

Westinghouse Induction Wattmeter Type C.

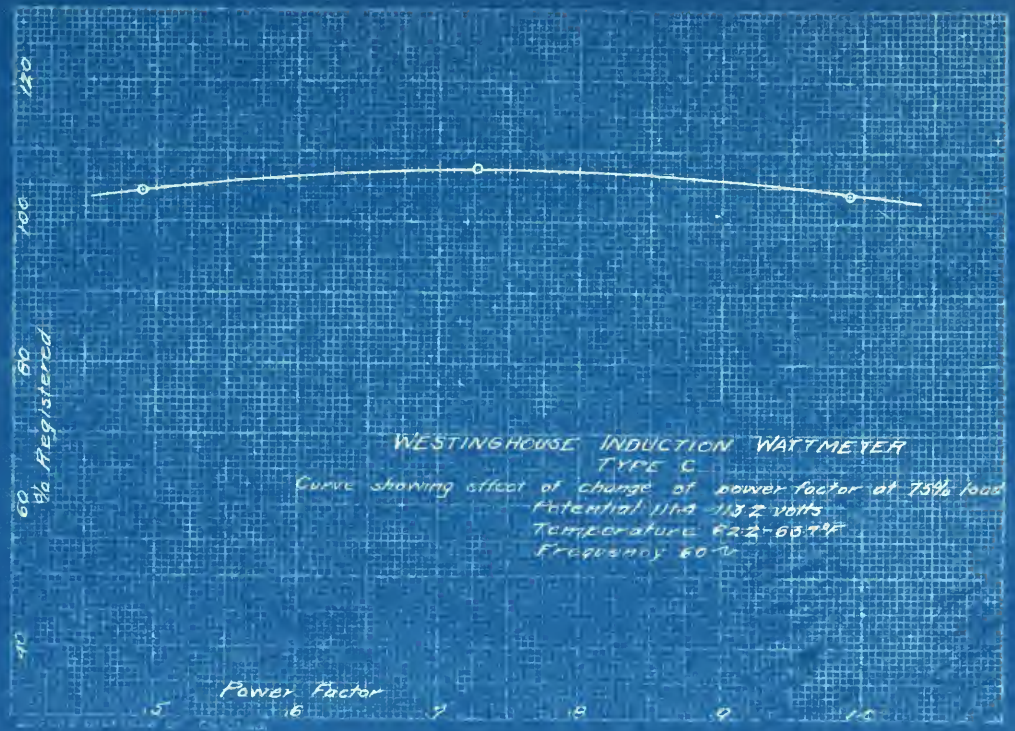
Data showing the effect of change of power factor at 75% load.

Potential = 111.4 - 113.2 volts

Temperature = 62.2 -63.7°F.

Frequency= 60cycles/sec.

Current	Power factor	% Registered
7.48	.491	104.3
7.48	.727	107.2
7.5	.99	104.0



WESTINGHOUSE INDUCTION WATTMETER

TYPE C

Curve showing effect of change of power factor at 75% load

Potential 114 113.2 volts

Temperature 62.2-66.7°F

Frequency 60 ~

Westinghouse Induction Wattmeter Type C,

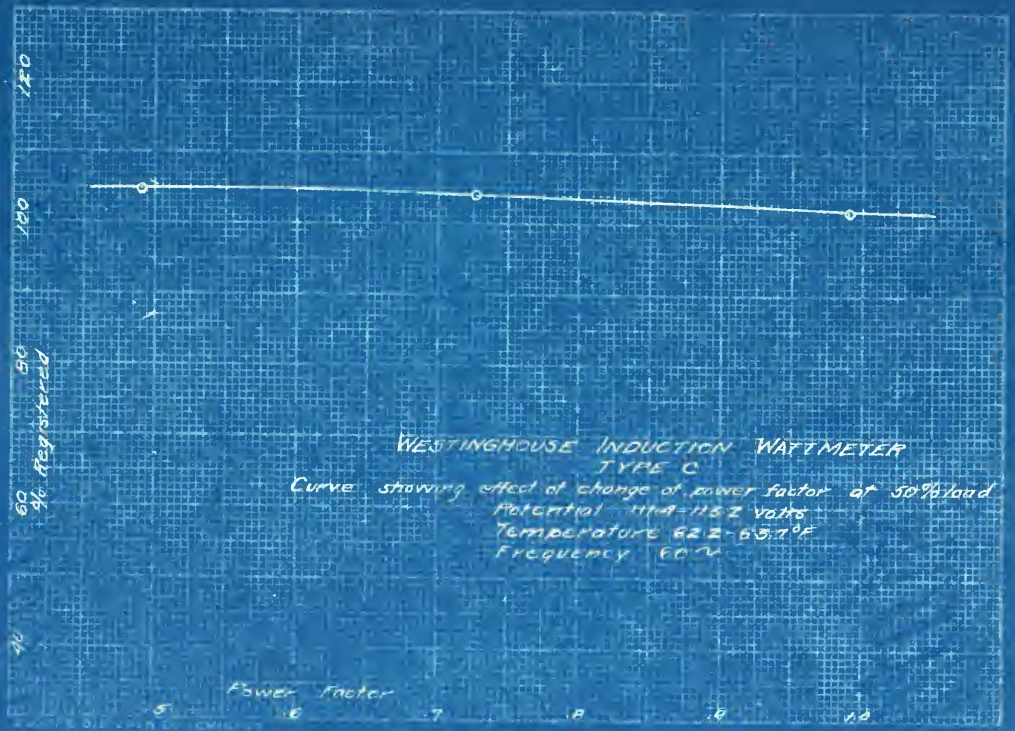
Data showing the effect of change of power factor at 50% load.

Potential = 111.4 - 113.2 volts

Temperature = 62.2 - 63.7°F.

Frequency = 60 cycles/sec.

Current	Power factor	Registered %
5.0	.491	104.9
5.0	.727	104.0
5.25	.99	101.9



WESTINGHOUSE INDUCTION WATTMETER
TYPE C

Curve showing effect of change of power factor at 50% load
Potential 114.4-116.2 volts
Temperature 62.2-63.7°F
Frequency 60 ~

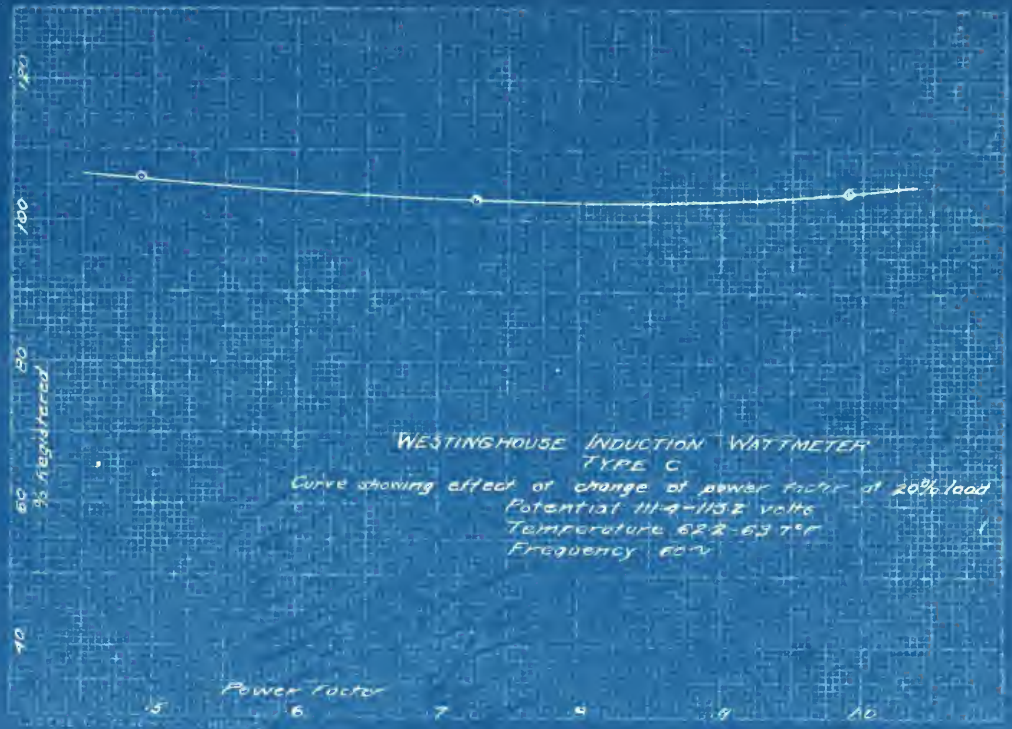
Westinghouse Induction Wattmeter Type C.

Data showing the effect of change of power factor at 20% load. Potential = 111.4 - 113.2 volts

Temperature = 62.2 - 63.7°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
2.02	.491	106.0
2.02	.727	103.0
2.0	.99	104.1



WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of power factor at 20% load
Potential 111.4-113.2 volts
Temperature 62.2-63.7°F
Frequency 60~

Westinghouse Induction Wattmeter Type C.

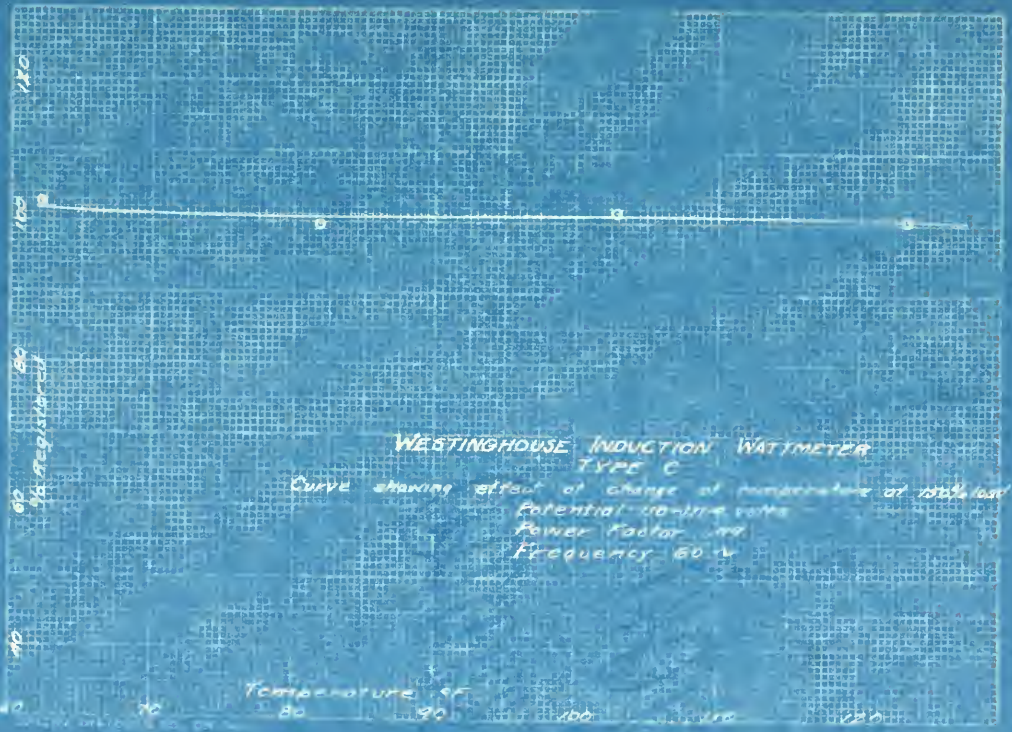
Data showing the effect of change of temperature at 150% Load.

Potential = 110 -111.4 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
15.6	62.2	102.6
15.6	81.7	99.8
15.6	102.8	101.3
15.6	123.4	100.6



WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of temperature on 100% load
Potential 120 line volts
Power factor 1.0
Frequency 60 ~

Westinghouse Induction Wattmeter Type C.

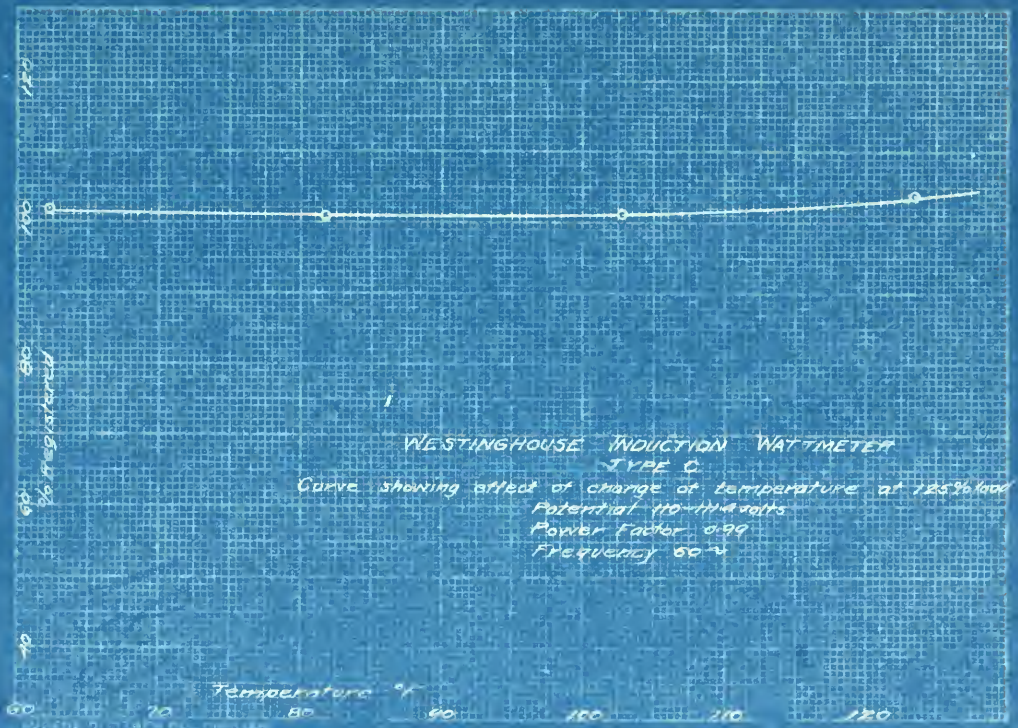
Data showing the effect of change of temperature at 125% load.

Potential = 110 - 111.4 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
12.9	62.2	101.9
12.9	81.7	100.5
12.9	102.8	101.0
12.9	123.4	103.8



WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of temperature at 125% load
Potential 110-111.4 volts
Power factor 0.99
Frequency 60 ~

Westinghouse Induction Wattmeter Type C.

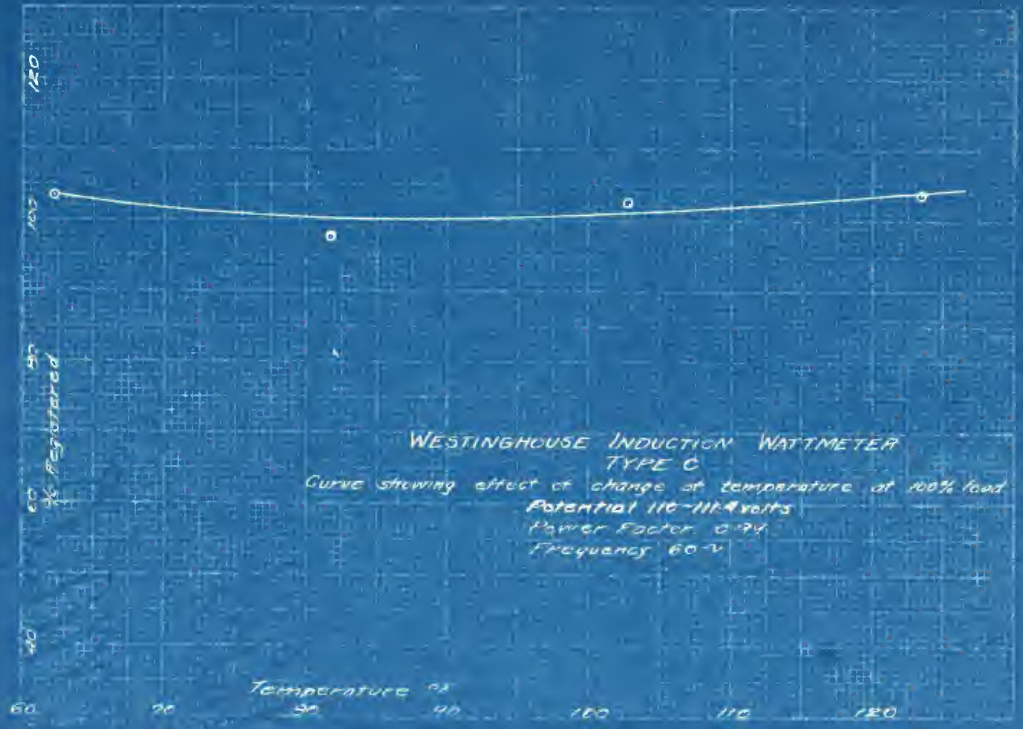
Data showing the effect of change of temperature at 100% load.

Potential = 110 - 111.4 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
10.3	62.2	103.3
10.3	81.7	97.6
10.3	102.8	102.3
10.3	123.4	103.8



WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of temperature at 100% load
Potential 110-114 volts
Power Factor 0.99
Frequency 60~

Westinghouse Induction Wattmeter Type C,

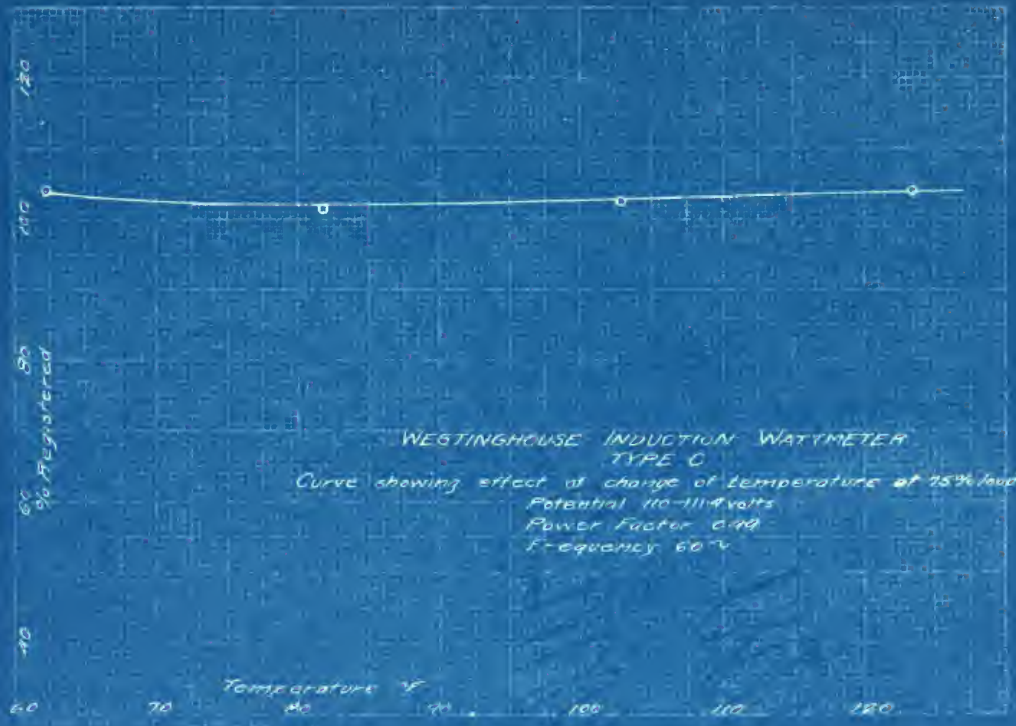
Data showing the effect of change of temperature at 75% load.

Potential = 110 - 111.4 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
7.5	62.2	104.0
7.5	81.7	101.7
7.5	102.8	102.2
7.5	123.4	103.8


120
110
100
90
% Registered
WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of temperature at 75% load
Potential 110-111 volts
Power Factor 0.99
Frequency 60 ~
Temperature °F
60
70
80
90
100
110
120

Westinghouse Induction Wattmeter Type C.

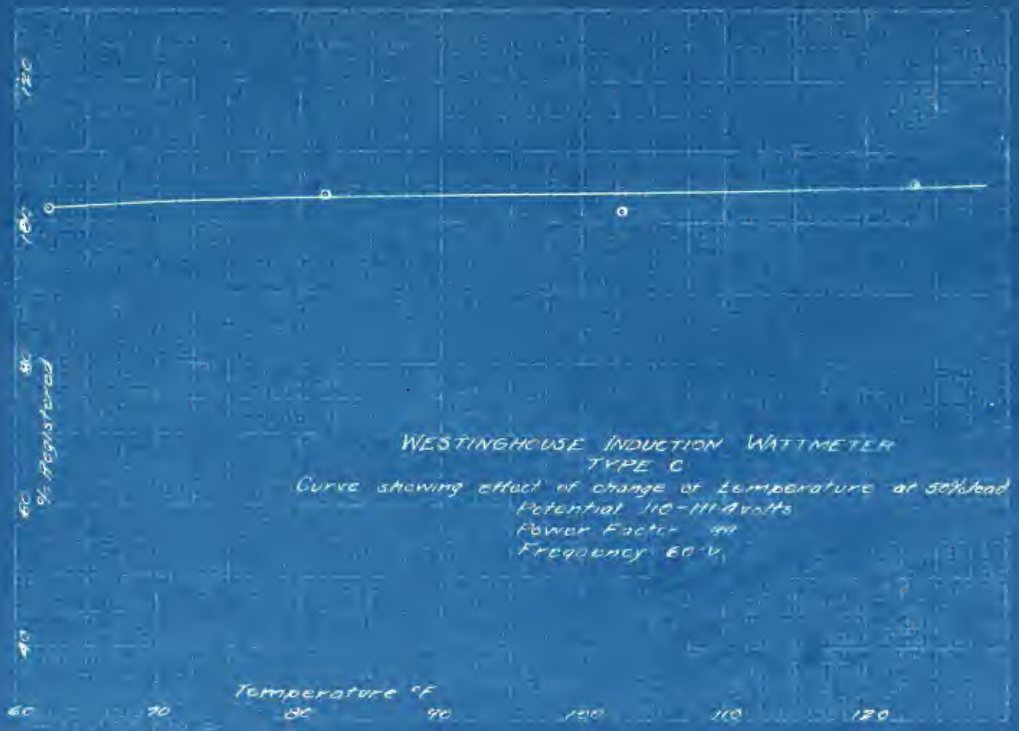
Data showing the effect of change oftemperature at 50% load.

Potential = 110 - 111.4 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	Registered %
5.25	62.2	101.9
5.25	81.7	103.9
5.25	102.8	101.6
5.25	123.4	105.5



WESTINGHOUSE INDUCTION WATTMETER
TYPE C
Curve showing effect of change of temperature at 50% load
Potential 110-111 Volts
Power Factor 99
Frequency 60 ~

Westinghouse Induction Wattmeter Type C.

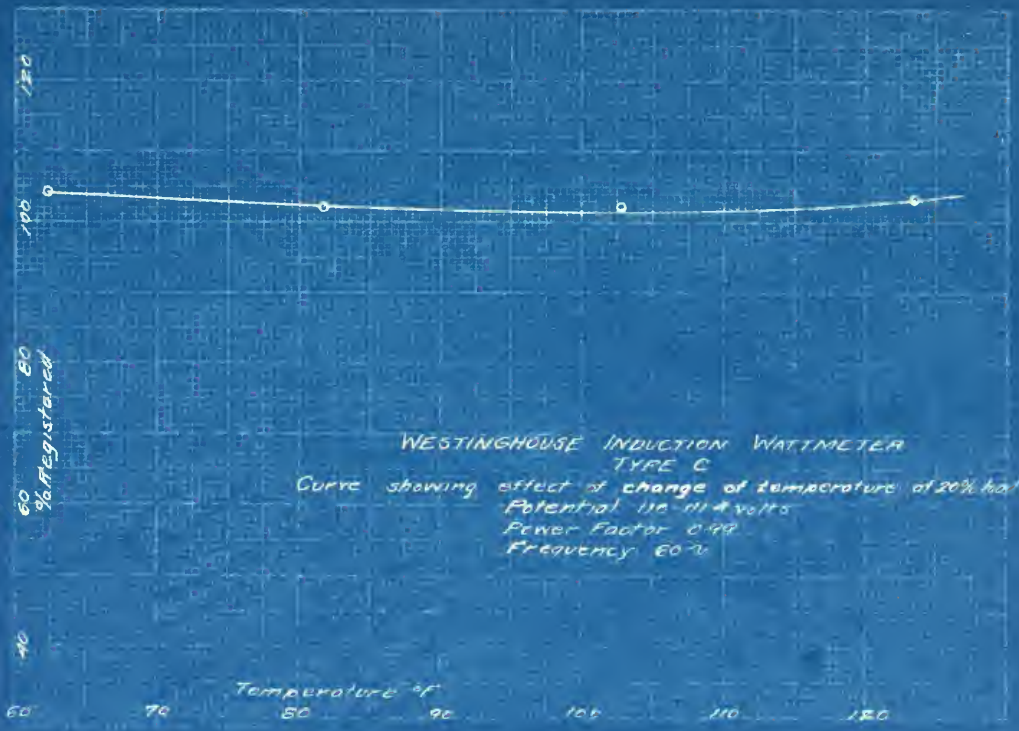
Data showing the effect of change of temperature at 20% load.

Potential = 110 - 111.4 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
2.00	62.2	104.1
2.00	81.7	102.2
2.00	102.8	102.0
2.00	123.4	103.2



WESTINGHOUSE INDUCTION WATTMETER
TYPE C

Curve showing effect of change of temperature of 20% load
Potential 110-114 volts
Power Factor 0.99
Frequency 60 ~

Westinghouse Induction Wattmeter Type C.

Shunt Loss = 1.25 watts at 110 volts and 60 cycles per second.

Series Loss = 2.52 watts at 10 amperes and 60 cycles/second.

Determination of Flux Quadrature

Amperes	Volts	Watts	Cos θ	θ
10.0	104.9	1.0	.00095	89° 56' 43"

FORT WAYNE
INDUCTION WATTMETER

TYPE K

NO 65181

KILOWATT HOURS
10
100

Fort Wayne Induction Wattmeter Type K.

Data showing the effect of change of load at normal voltage and frequency, and unity power factor.

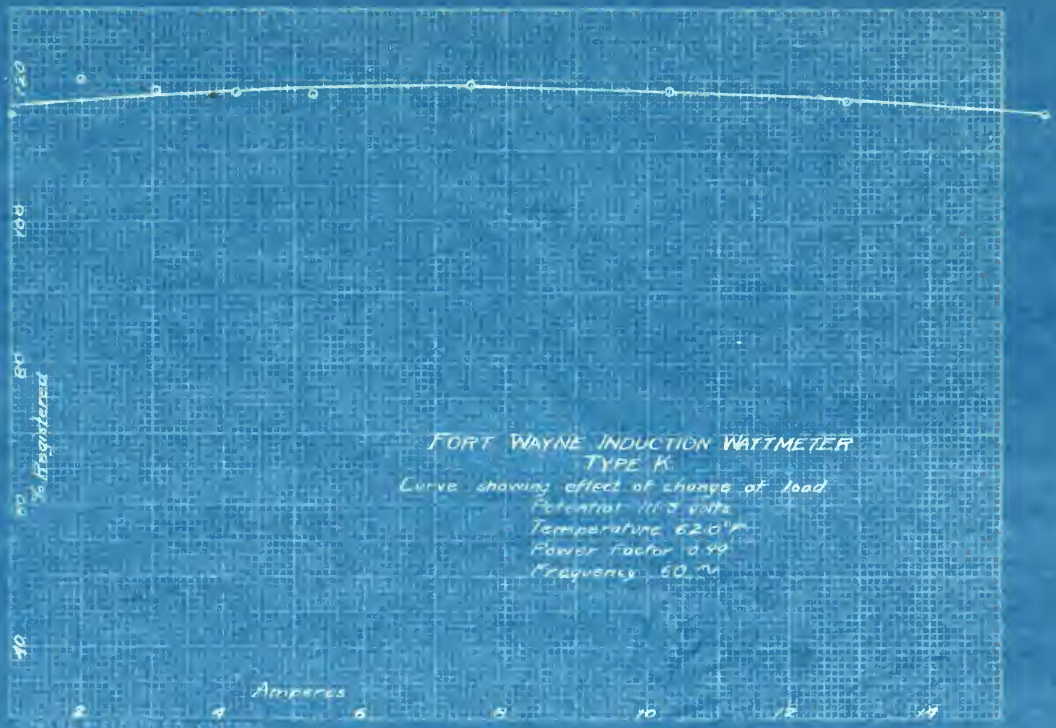
Potential = 111.3 volts

Temperature = 62.0°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	142.0	163.2	115.0
12.8	118.0	138.0	117.0
10.3	93.3	110.6	118.4
7.5	68.3	81.4	119.2
5.25	46.9	55.3	118.0
4.18	37.2	44.0	118.2
3.02	29.9	35.4	118.5
2.00	18.9	22.7	120.0
0.98	9.3	10.7	115.1



FORT WAYNE INDUCTION WATTMETER
TYPE K

Curve showing effect of change of load

Potential 110.3 volts
Temperature 62.0° F.
Power Factor 0.99
Frequency 60 ~

Fort Wayne Induction Wattmeter Type K.

Data showing the effect of change of load at normal frequency, unity power factor, and 75% normal voltage.

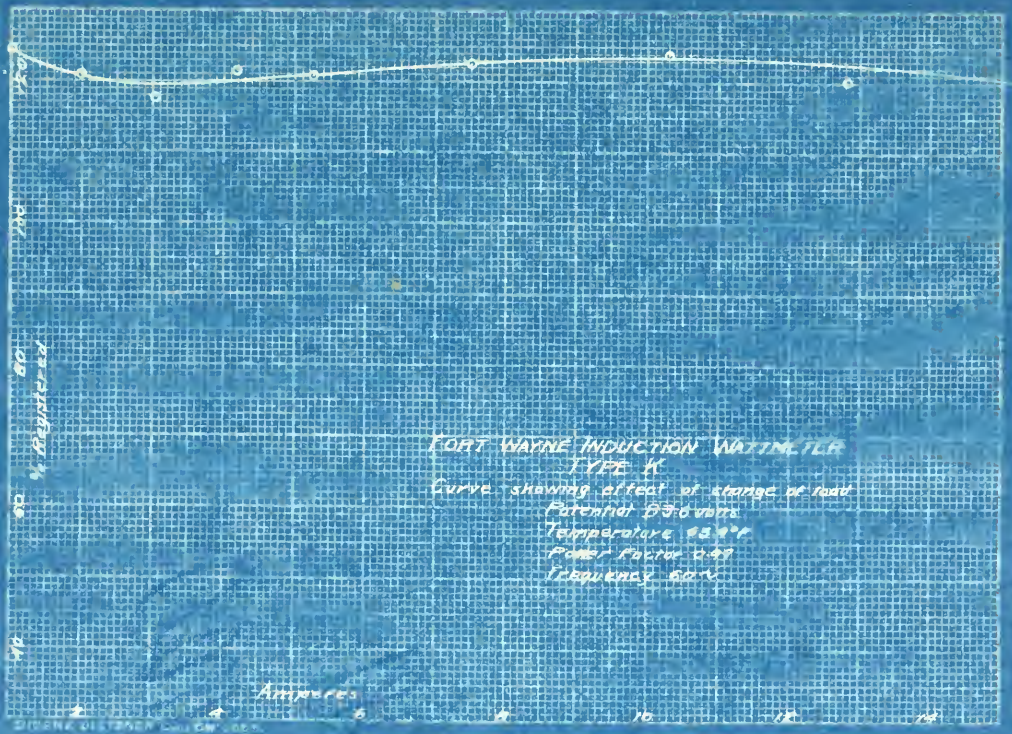
Potential = 83.6 volts

Temperature = 63.9°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	102.2	122.1	119.5
12.8	88.8	106.8	120.0
10.3	66.5	82.6	124.2
7.5	49.0	60.0	122.4
5.25	34.2	41.3	120.9
4.18	27.4	33.3	121.7
3.02	20.35	24.0	117.9
2.00	13.7	16.6	121.0
0.98	6.43	8.0	124.2



FORT WAYNE INDUCTION WATTMETER
TYPE K
Curve showing effect of change of load
Potential 230 volts
Temperature 25.1°C
Power Factor 0.99
Frequency 60 ~

Fort Wayne Induction Wattmeter Type K.

Data showing the effect of change of load at normal frequency, unity power factor, and 90% normal voltage.

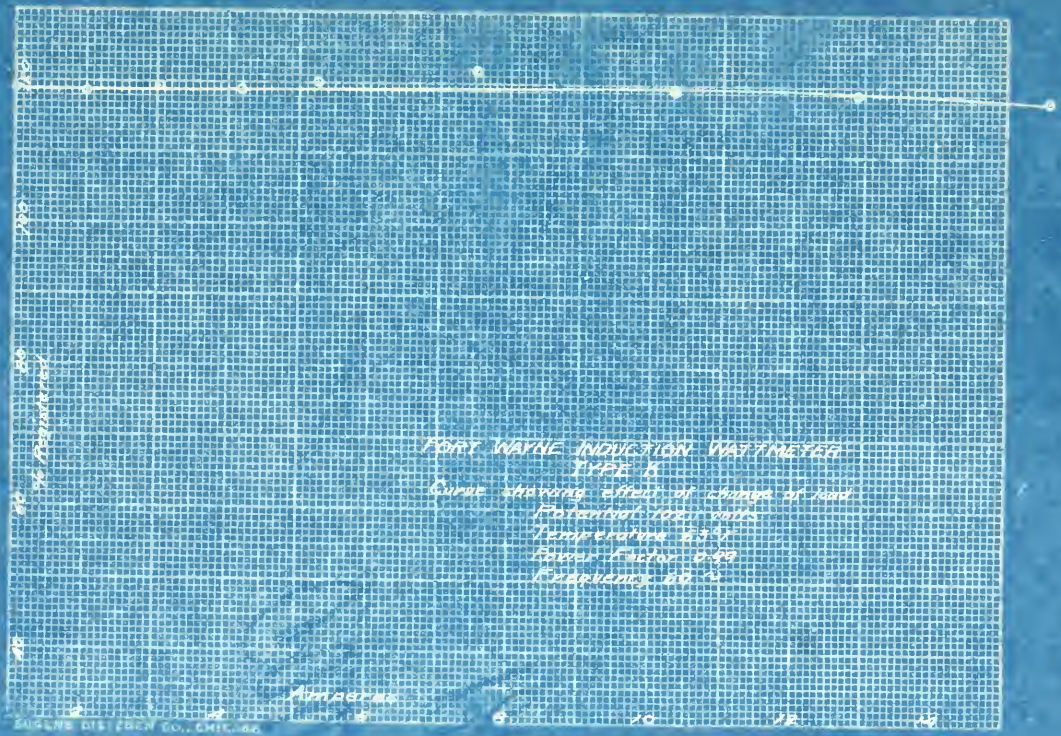
Potential = 102.1 volts

Temperature = 63.0°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	128.2	151.2	118.0
12.9	106.0	126.5	118.9
10.3	83.9	100.0	119.2
7.5	61.3	74.6	121.8
5.25	42.1	50.6	120.1
4.18	33.6	40.0	119.0
3.02	25.6	30.6	119.4
2.00	17.4	20.6	118.7
0.98	7.82	9.3	119.1


FORT WAYNE INDUCTION WATTMETER
Type 6
Curve showing effect of change of load
Temperature rise 40°C
Frequency 25 ~
Power Factor 0.75
Connections as 3
Amperes
Engine Dietzgen Co., Chic. &c

Fort Wayne Induction Wattmeter Type K.

Data showing the effect of change of load at normal frequency, unity power factor, and 110% normal voltage.

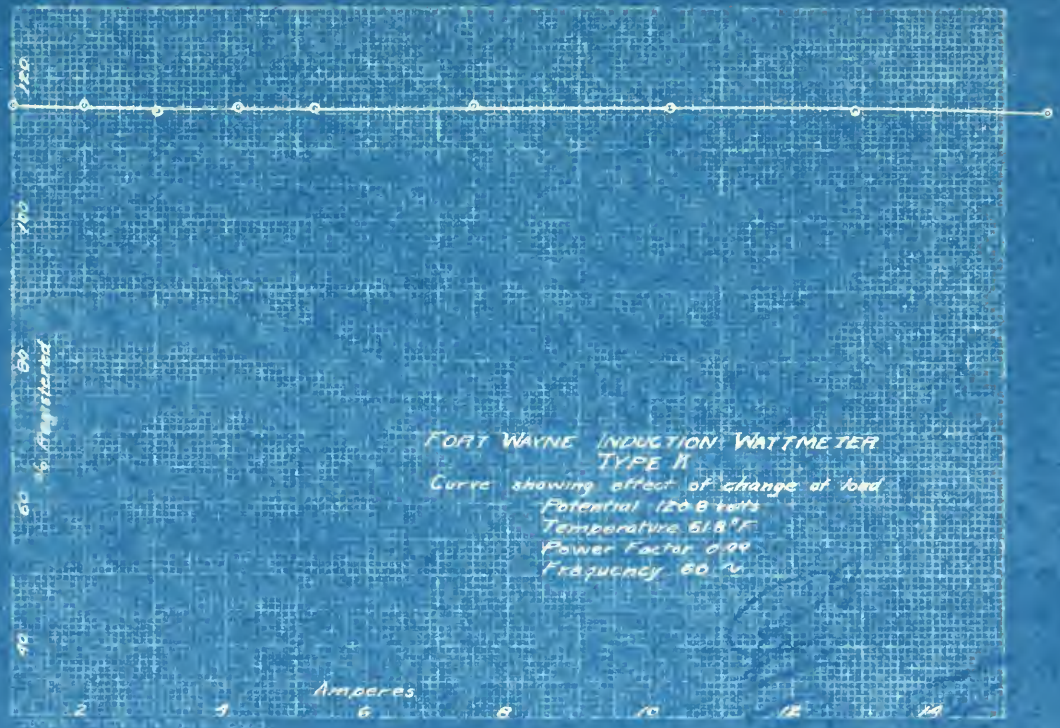
Potential = 120.8 volts

Temperature = 61.8°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	155.8	179.1	115.1
12.9	127.5	147.2	115.4
10.3	100.0	116.0	116.0
7.5	74.5	86.6	116.2
5.25	50.7	58.6	115.6
4.18	40.2	46.6	116.0
3.02	30.0	34.6	115.2
2.00	20.65	24.0	116.1
0.98	10.33	12.0	116.1



FORT WAYNE INDUCTION WATTMETER
TYPE H
Curve showing effect of change of load
Potential 120.8 Volts
Temperature 61.8°F.
Power Factor 0.99
Frequency 60 ~

Fort Wayne Induction Wattmeter Type K.

Data showing the effect of change of load at normal voltage, unity power factor, and 66⅔% normal frequency.

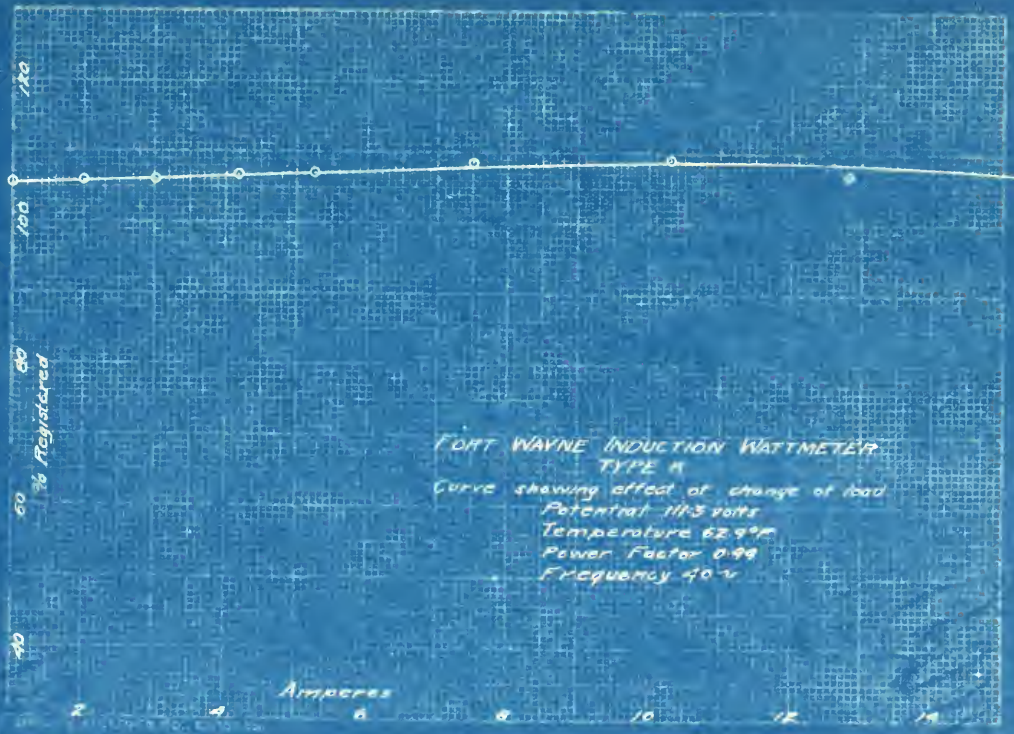
Potential = 111.3 volts

Temperature = 62.9°F

Power factor = .99

Frequency = 40 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	141.7	151.2	106.9
12.8	117.2	125.3	106.9
10.3	92.4	100.7	109.0
7.5	67.5	73.3	108.8
5.25	46.7	50.0	107.0
4.18	37.5	40.0	106.8
3.02	28.3	30.0	106.0
2.00	18.9	20.0	105.8
0.98	9.5	10.0	105.2



FORT WAYNE INDUCTION WATTMETER
TYPE A
Curve showing effect of change of load
Potential 111.3 volts
Temperature 62.9°F
Power Factor 0.99
Frequency 40 ~

Fort Wayne Induction Wattmeter TypeK.

Data showing the effect of change of load at normal voltage, unity power factor, and 133% normal frequency.

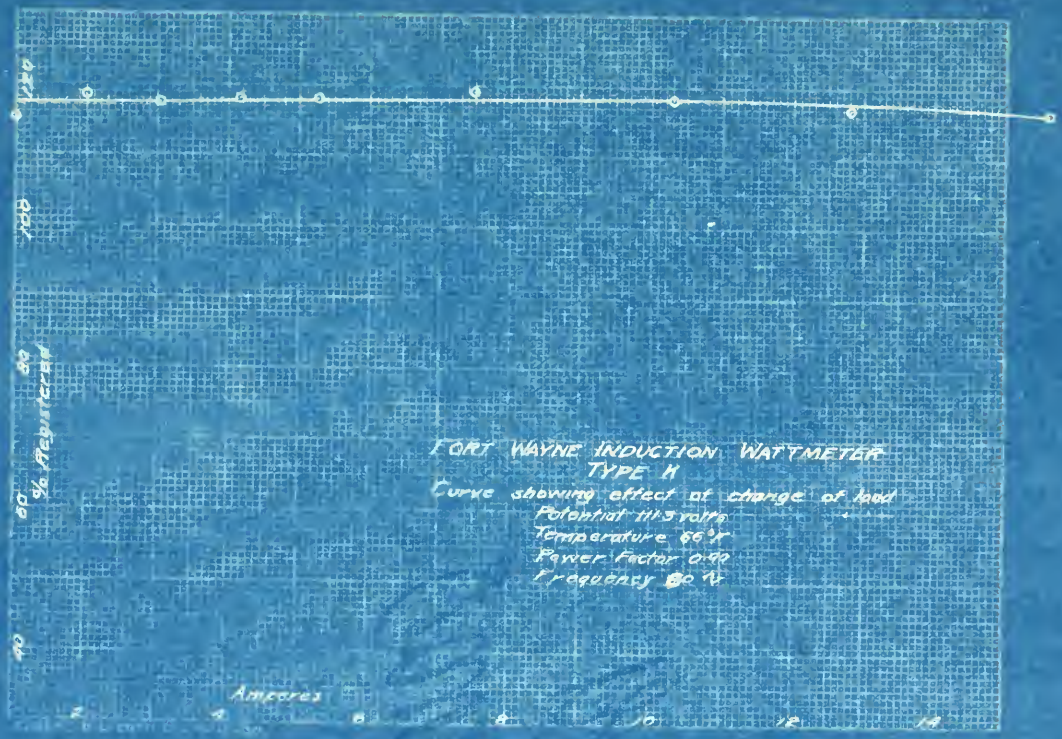
Potential = 111.3 volts

Temperature = 66.0°F.

Power factor = .99

Frequency = 80 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	142.0	165.2	116.4
12.8	118.0	138.0	116.9
10.3	93.0	110.0	118.2
7.5	68.2	81.2	119.1
5.25	46.3	54.6	118.0
4.18	37.3	44.0	118.0
3.02	28.3	33.3	117.5
2.00	19.1	22.6	118.2
0.98	9.3	10.7	115.0


% Registration
Amperes
FORT WAYNE INDUCTION WATTMETER
TYPE H
Curve showing effect of change of load
Potential 111.3 volts
Temperature 66° F
Power Factor 0.99
Frequency 60 ~

Fort Wayne Induction Wattmeter Type K.

Data showing the effect of change of load at normal voltage and frequency, and 75% power factor.

Potential = 111.3 volts

Temperature = 65.9°F.

Power factor = .734

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	103.0	124.0	120.4
12.8	85.9	103.3	120.5
10.3	68.3	83.3	122.0
7.5	53.6	66.6	124.1
5.25	35.6	43.3	121.8
4.18	28.2	33.3	118.0
3.02	21.5	25.4	118.0
2.00	14.1	16.7	118.4
0.98	7.74	8.7	112.6

FLOAT WATTAGE INDICATING INSTRUMENTS
TYPE M
Curve showing action at change of load
Alternating Current
Temperature Error
Power Factor 0.785
Frequency Error
Amperes
EUGENE DIETZGEN CO., CHICAGO.

Fort Wayne Induction Wattmeter Type K.

Data showing the effect of change of load at normal voltage and frequency, and 50% power factor.

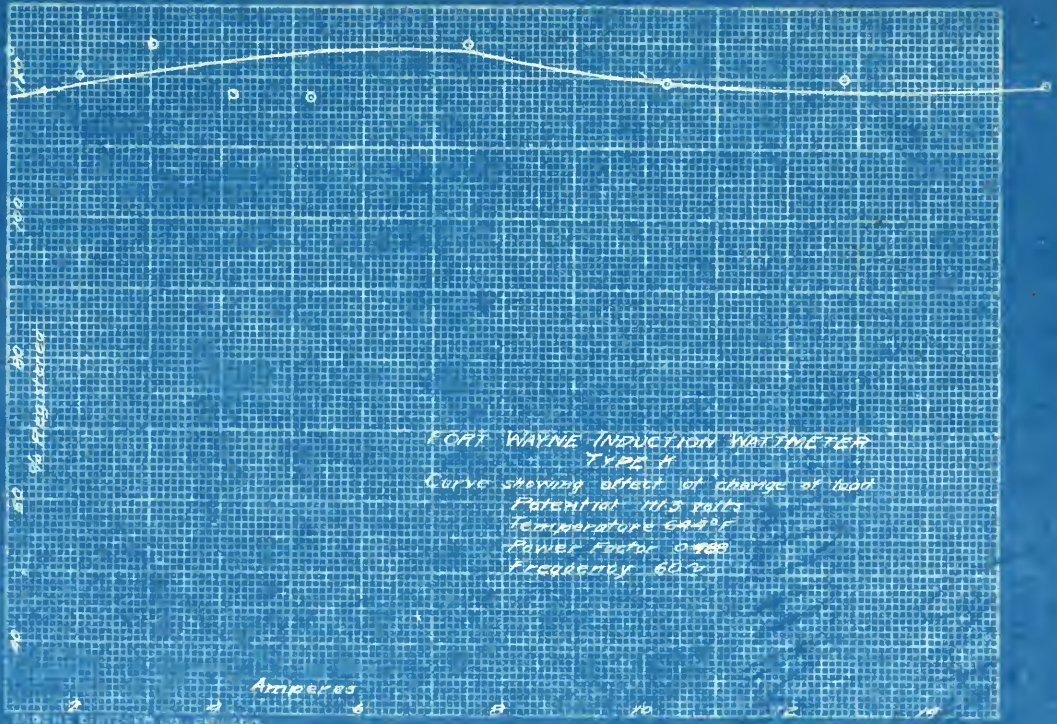
Potential = 111.3 volts

Temperature = 64.4°F.

Power factor = .488

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	68.3	81.4	119.0
12.8	57.8	69.4	120.0
10.3	46.3	55.3	119.2
7.5	34.8	43.3	124.5
5.25	25.6	30.0	117.1
4.18	20.4	24.0	117.8
3.02	13.4	16.7	124.6
2.00	10.0	12.0	120.0
0.98	5.43	6.7	123.5


FORT WAYNE INDUCTION WATTMETER
Type A
Curve showing effect of change of load
Potential 110.5 volts
Temperature 64½°F
Power Factor 0.988
Frequency 60~
Amperes
Percentage Error

Fort Wayne Induction Wattmeter Type K.

Data showing the effect of change of load at normal voltage and frequency, and unity power factor.

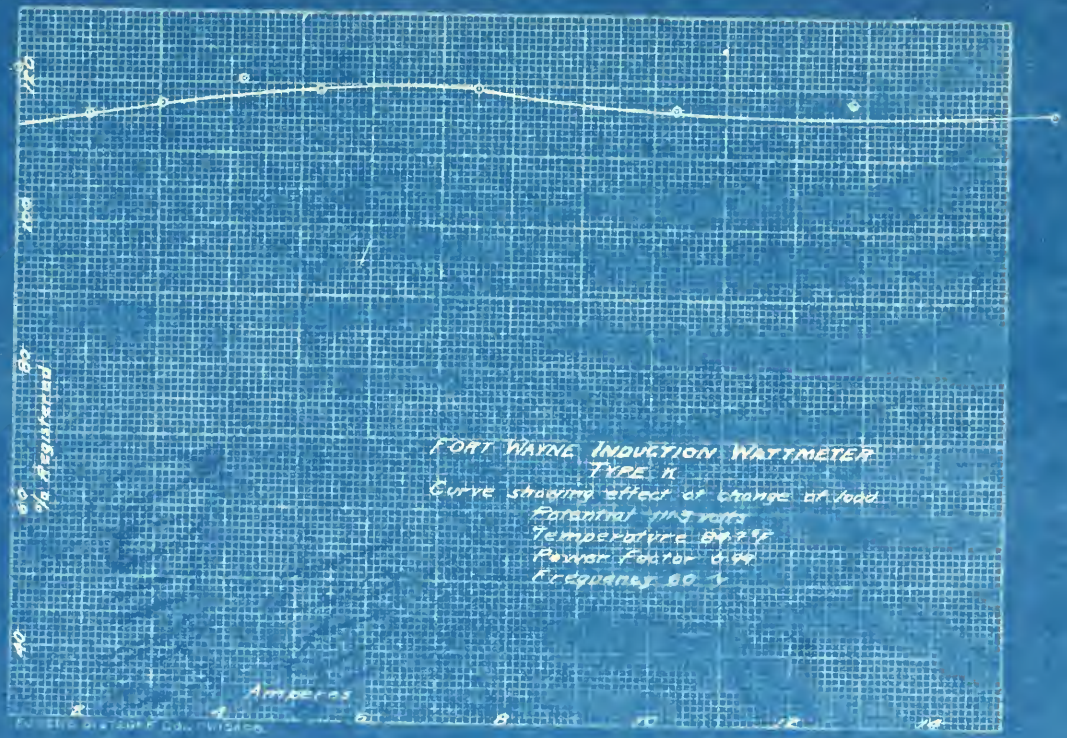
Potential = 111.3 volts

Temperature = 84.7°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	143.0	166.6	116.6
12.8	118.5	139.3	117.8
10.3	92.6	108.0	116.8
7.5	68.0	81.4	119.6
5.25	47.0	56.0	119.0
4.18	37.6	45.3	120.4
3.02	28.5	33.3	117.0
2.00	19.1	22.0	115.2
0.98	9.86	12.0	121.7


100%
100
80
60
% Registered
40
Amperes
A
B
C
D
E
FORT WAYNE INDUCTION WATTMETER
TYPE K
Curve showing effect of change of load
Potential 115 volts
Temperature 68.7°F
Power Factor 0.99
Frequency 60 ~

Fort Wayne Induction Wattmeter Type K.

Data showing the effect of change of load at normal voltage and frequency, and unity power factor.

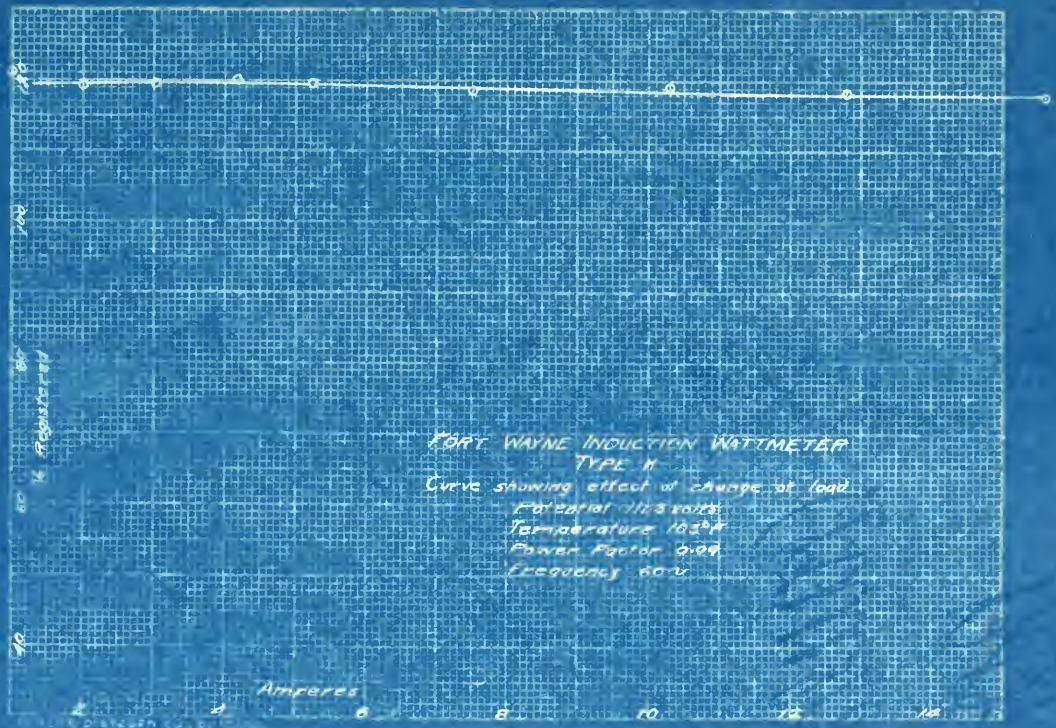
Potential = 111.3 volts

Temperature = 103.0°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	142.0	167.2	117.9
12.8	120.0	142.0	118.3
10.3	93.5	111.3	119.0
7.5	68.0	80.6	118.6
5.25	46.9	56.0	119.5
4.18	37.8	45.3	120.0
3.02	28.4	34.0	119.8
2.00	19.5	23.3	119.3
0.98	9.35	11.3	121.0


FORT WAYNE INDUCTION WATTMETER
TYPE H
Curve showing effect of change of load
Temperature 103°F
Power Factor 1.00
Frequency 60~
Amperes
0
8
10
12
14
Registration

Fort Wayne Induction Wattmeter Type K.

Data showing the effect of change of load at normal voltage and frequency, and unity power factor.

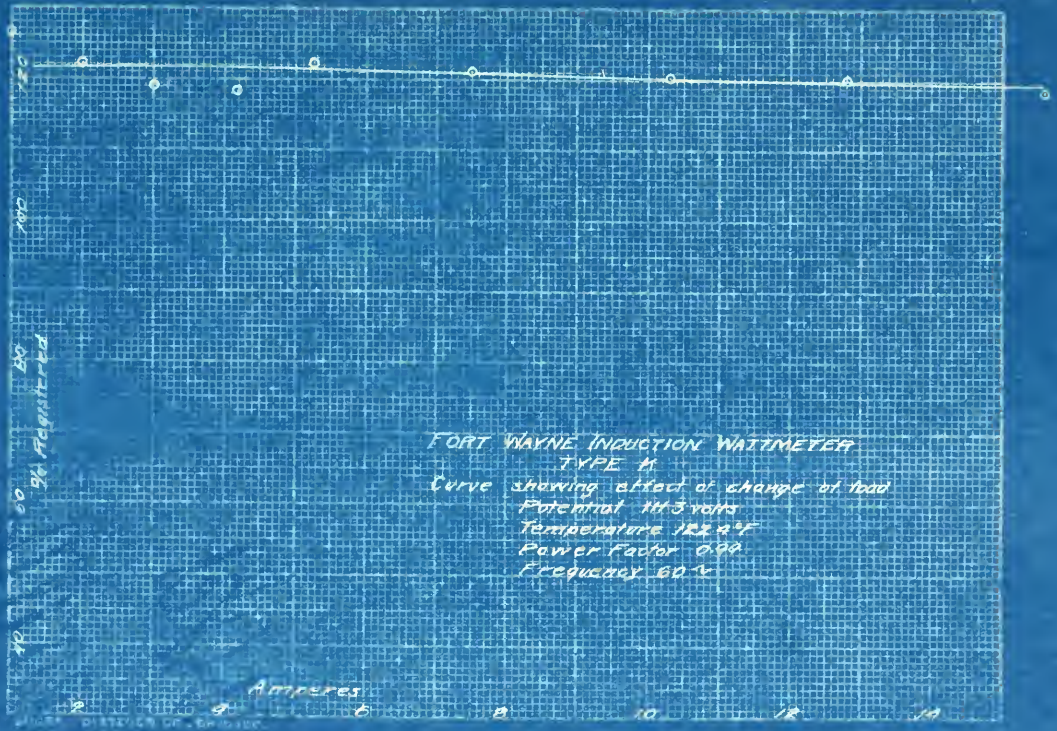
Potential = 122.4 volts

Temperature = 122.4°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Watt-hours measured	Watt-hours registered	% registered
15.6	144.0	170.7	118.7
12.8	119.4	143.3	120.0
10.3	94.3	113.2	120.3
7.5	69.5	84.0	121.0
5.25	47.6	57.3	122.2
4.18	37.8	44.6	118.1
3.02	28.5	34.0	119.1
2.00	19.1	23.3	122.0
0.98	9.5	12.0	126.2


FORT WAYNE INDUCTION WATTMETER
TYPE M
Curve showing effect of change of load
Potential 111.3 volts
Temperature 122.9°F
Power Factor 0.99
Frequency 60 ~
% Adjusted
Amperes
2
4
6
8
10
12
14

Fort Wayne Induction Wattmeter Type K.

Data showing the effect of change of voltage at 150% load.

Temperature = 61.8 - 63.9°F.

Power Factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
15.6	83.6	119.5
15.6	102.1	118.0
15.6	111.3	115.0
15.6	120.8	115.1

FIGURE 3. MAXIMUM ALLOWABLE
CURVE SHOWING RELATION OF HUMIDITY OF
FEMALE-BREEDING ROOM
TO RECIRCULATED AIR

Fort Wayne Induction Wattmeter Type K.

Data showing the effect of change of voltage at 125% load.

Temperature = 61.8 - 63.9°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
12.8	83.6	120.0
12.8	102.1	118.9
12.8	111.3	117.0
12.8	120.8	115.4

% Required
70
60
50
40
30
20
10
0
Mixing
Curve showing Percentage of Cement by Volume to Water required to produce Maximum Strength
Fig. 1

Fort Wayne Induction Wattmeter Type K.

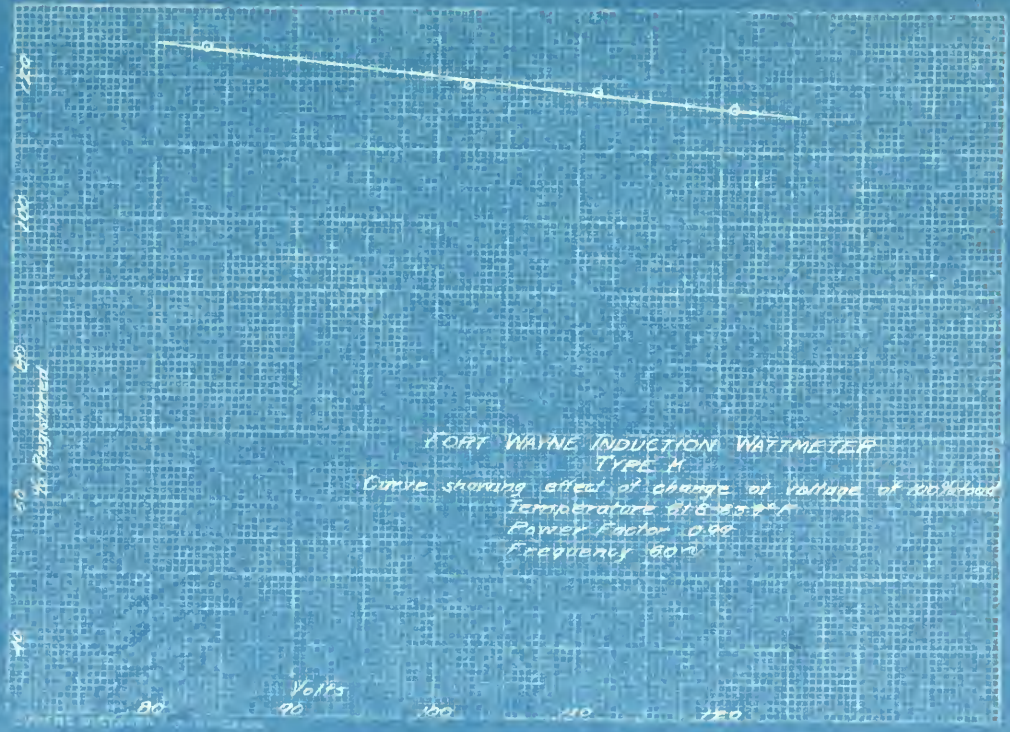
Data showing the effect of change of voltage at 100% load.

Temperature = 61.8 - 63.9°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
10.3	83.6	124.2
10.3	102.1	119.2
10.3	111.3	118.4
10.3	120.8	116.0



FORT WAYNE INDUCTION WATTMETER
TYPE H
Curve showing effect of change of voltage at 100% load
Temperature 81° C. = 177° F.
Power Factor 0.98
Frequency 60 ~

Fort Wayne Induction Wattmeter Type K.

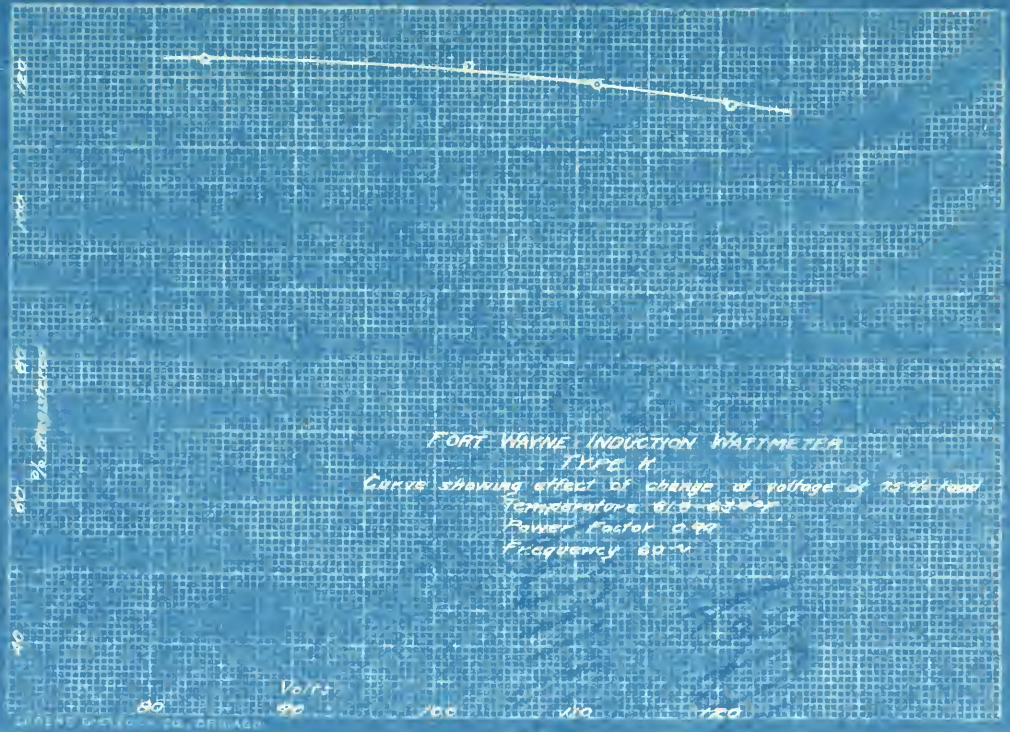
Data showing the effect of change of voltage at 75% load.

Temperature = 61.8 - 63.9°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
7.5	83.6	122.4
7.5	102.1	121.8
7.5	111.3	119.2
7.5	120.8	116.2


FORT WAYNE INDUCTION WATTMETER
TYPE K
Curve showing effect of change of voltage at no load
Temperature 61.3 degrees
Power Factor 0.00
Frequency 60 ~
Volts
60
80
100
110
120

Fort Wayne Induction Wattmeter Type K.

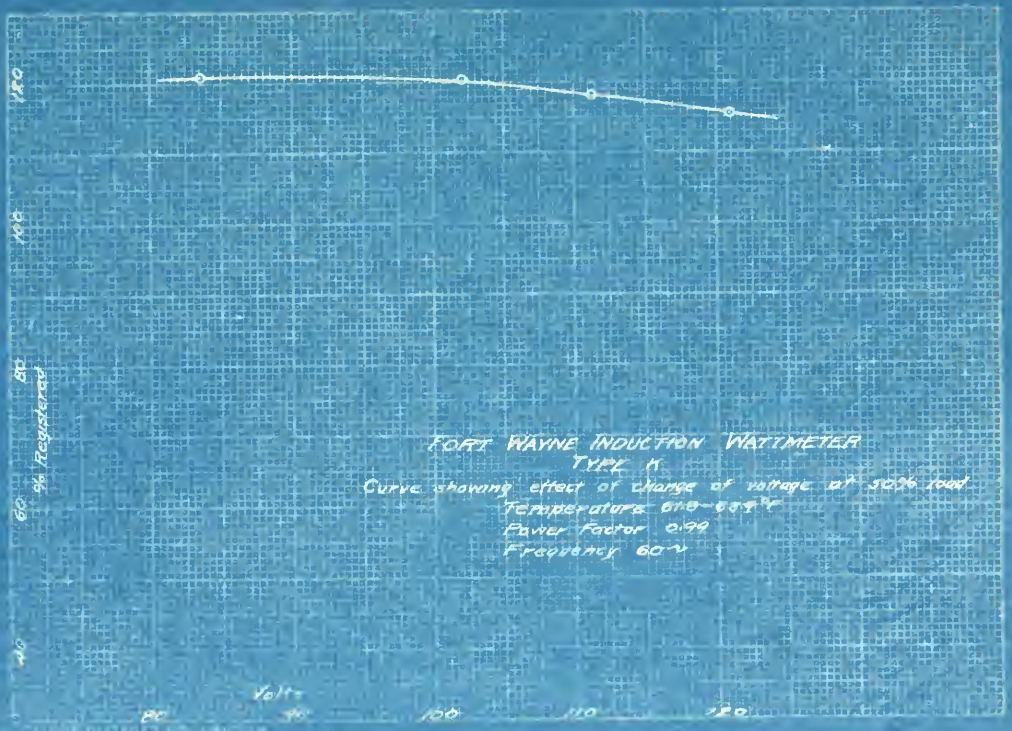
Data showing the effect of change of voltage at 50% load.

Temperature = 61.8 - 63.9°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
5.25	83.6	120.9
5.25	102.1	120.1
5.25	111.3	118.0
5.25	120.8	115.6



FORT WAYNE INDUCTION WATTMETER
Type A
Curve showing effect of change of voltage at 50.06 load
Temperature 61.8-63.5°F
Power Factor 0.99
Frequency 60~

Fort Wayne Induction Wattmeter Type K.

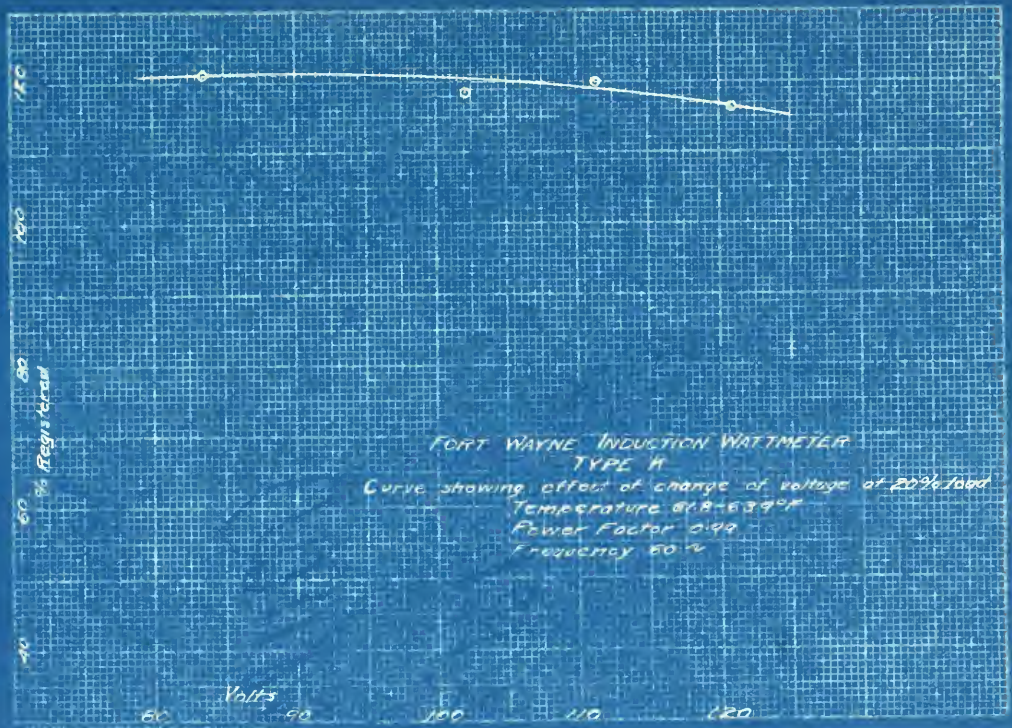
Data showing the effect of change of voltage at 20% load.

Temperature = 61.8 - 63.9°F.

Power factor = .99

Frequency = 60 cycles/sec.

Current	Voltage	% Registered
2.00	83.6	121.0
2.00	102.1	118.7
2.00	111.3	120.0
2.00	120.8	116.1



FORT WAYNE INDUCTION WATTMETER
TYPE H
Curve showing effect of change of voltage of 20% load
Temperature at A=63°F
Power Factor 0.99
Frequency 60 ~

Fort Wayne Induction Wattmeter Type K.

Data showing the effect of change of frequency at 150% load.

Potential = 111.3 volts

Temperature = 62.0 - 66.0°F.

Power factor = .99

Current	Frequency	% Registered
15.6	40	106.9
15.6	60	115.0
15.6	80	116.4

Fort Wayne Induction Wattmeter Type K.

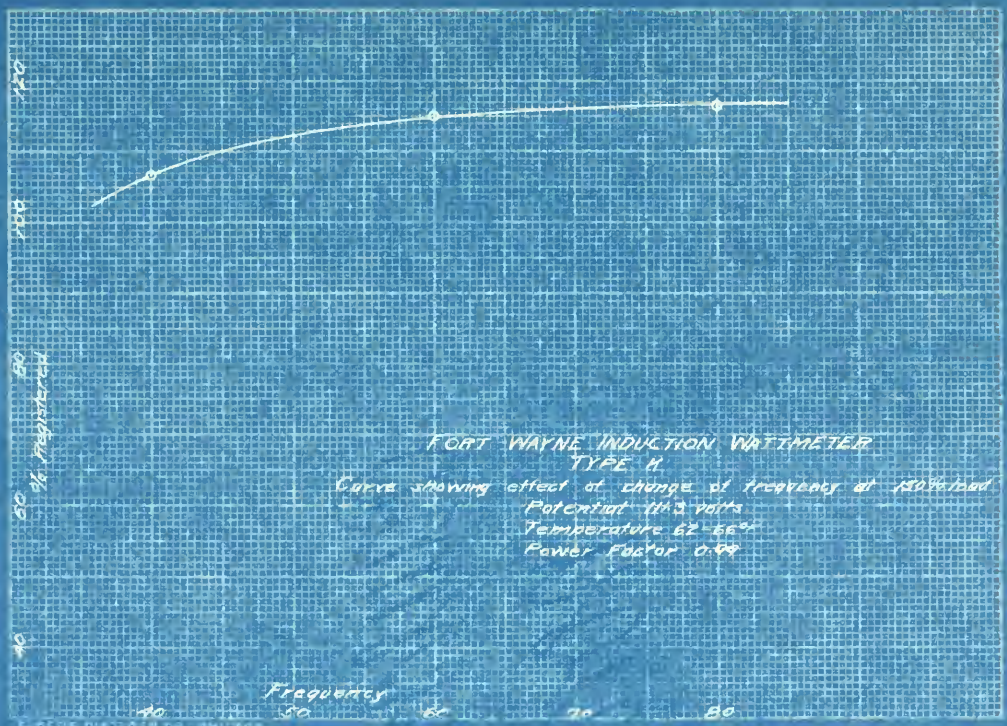
Data showing the effect of change of frequency at 150% load.

Potential = 111.3 volts

Temperature = 62.0 - 66.0°F.

Power factor = .99

Current	Frequency	% Registered
15.6	40	106.9
15.6	60	115.0
15.6	80	116.4



FORT WAYNE INDUCTION WATTMETER
TYPE H
Curve showing effect of change of frequency at 150% load
Potential 114 volts
Temperature 62-66°
Power Factor 0.99

Fort Wayne Induction Wattmeter Type K.

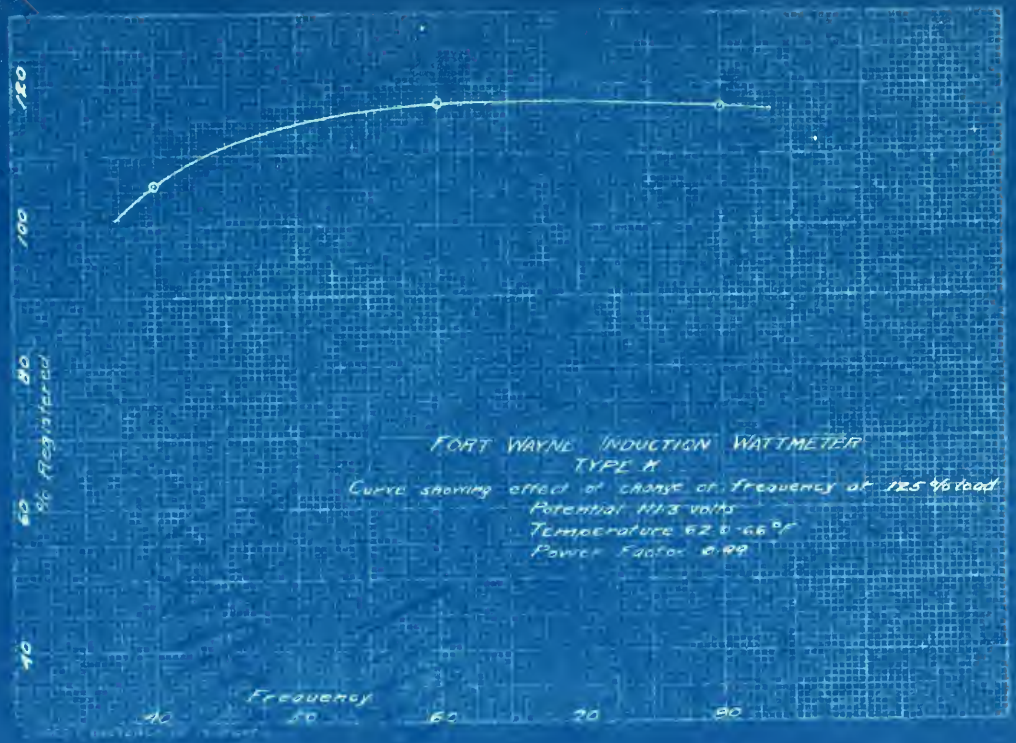
Data showing the effect of change of frequency at 125% load.

Potential = 111.3 volts

Temperature = 62.0 - 66.0°F.

Power factor = .99

Current	Frequency	% Registered
12.8	40	106.9
12.8	60	117.0
12.8	80	116.9



FORT WAYNE INDUCTION WATTMETER
TYPE A
Curve showing effect of change of Frequency at 125 % load
Potential 111.3 volts
Temperature 62.5 - 66.5° F
Power Factor 0.99

Fort Wayne Induction Wattmeter Type K.

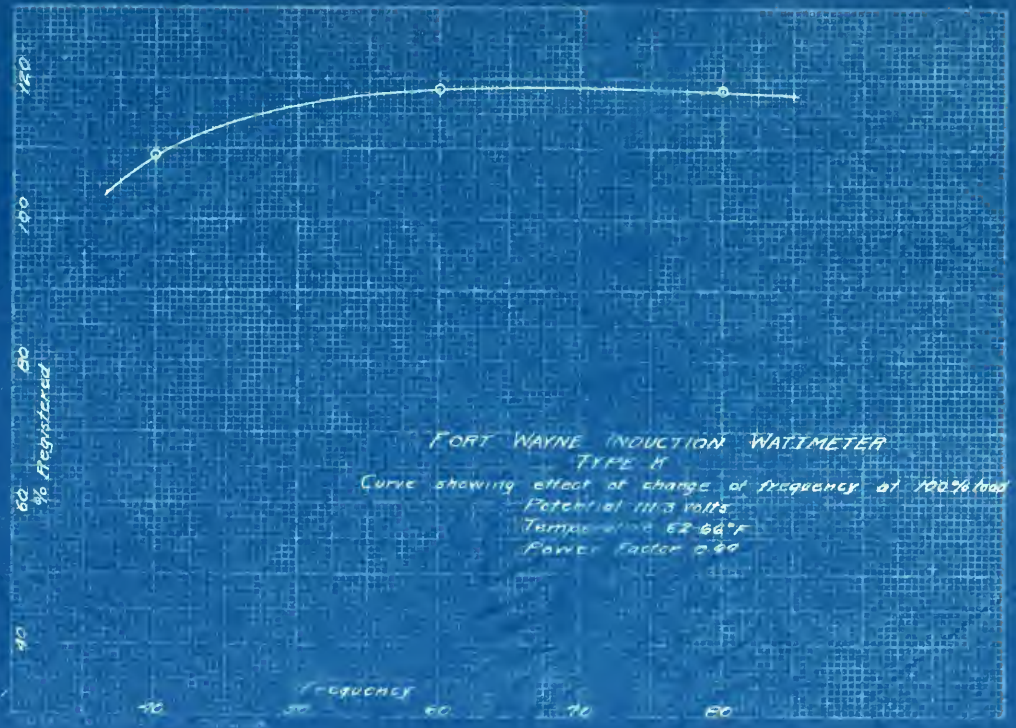
Data showing the effect of change of frequency at 100% load.

Potential = 111.3 volts

Temperature = 62.0 - 66.0°F.

Power factor = .99

Current	Frequency	% Registered
10.3	40	109.0
10.3	60	118.4
10.3	80	118.2



FORT WAYNE INDUCTION WATTMETER
TYPE H
Curve showing effect of change of frequency at 100% load
Potential 111.3 volts
Temperature 62-66°F
Power Factor 0.99

Fort Wayne Induction Wattmeter Type K.

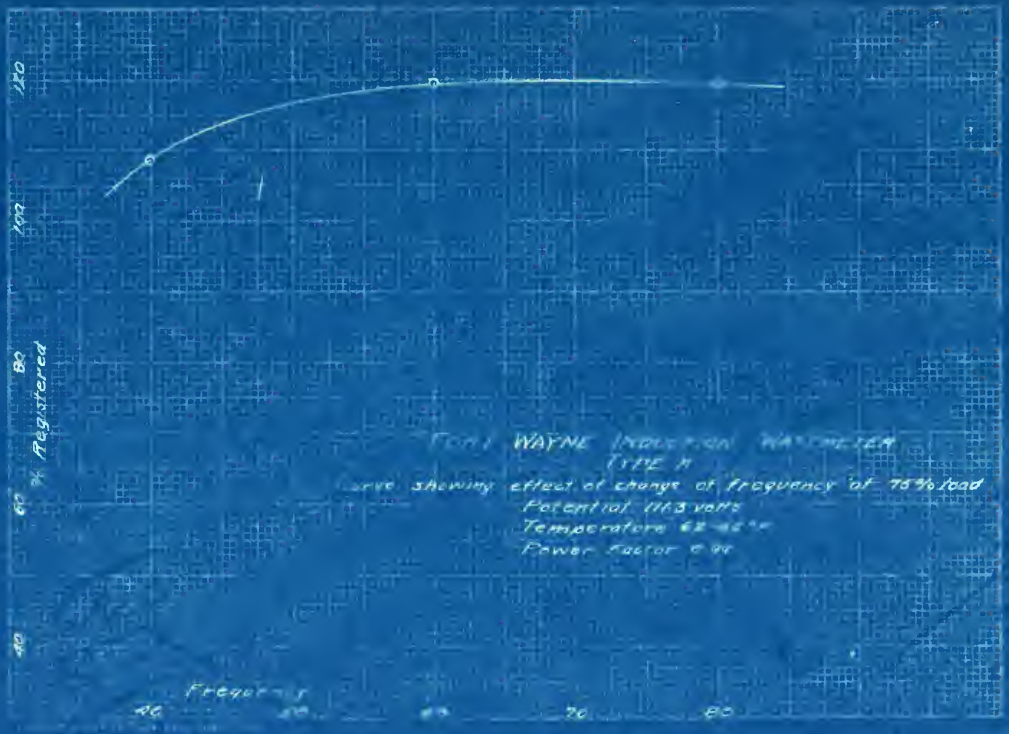
Data showing the effect of change of frequency at 75% load.

Potential = 111.3 volts

Temperature = 62.0 - 66.0°F.

Power factor = .99

Current	Frequency	% Registered
7.5	40	108.8
7.5	60	119.2
7.5	80	119.1



FORT WAYNE [illegible] METER
TYPE A
Curve showing effect of change of frequency at 75% load
Potential 117.3 volts
Temperature 62-63°F
Power Factor 0.99

Fort Wayne Induction Wattmeter Type K.

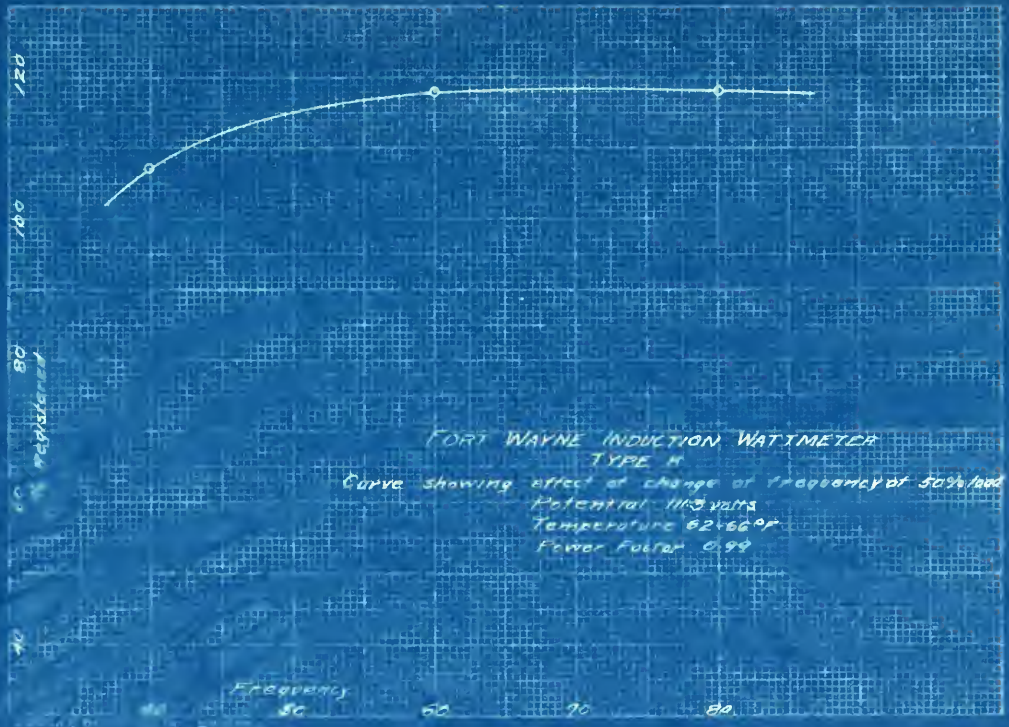
Data showing the effect of change of frequency at 50% load.

Potential = 111.3 volts

Temperature = 62.0 - 66.0°F.

Power factor = .99

Current	Frequency	% Registered
5.25	40	107.0
5.25	60	118.0
5.25	80	118.0



FORT WAYNE INDUCTION WATTMETER
TYPE H
Curve showing effect of change of frequency at 50% load
Potential 111.3 volts
Temperature 62-66°F
Power Factor 0.99

Fort Wayne Induction Wattmeter Type K.

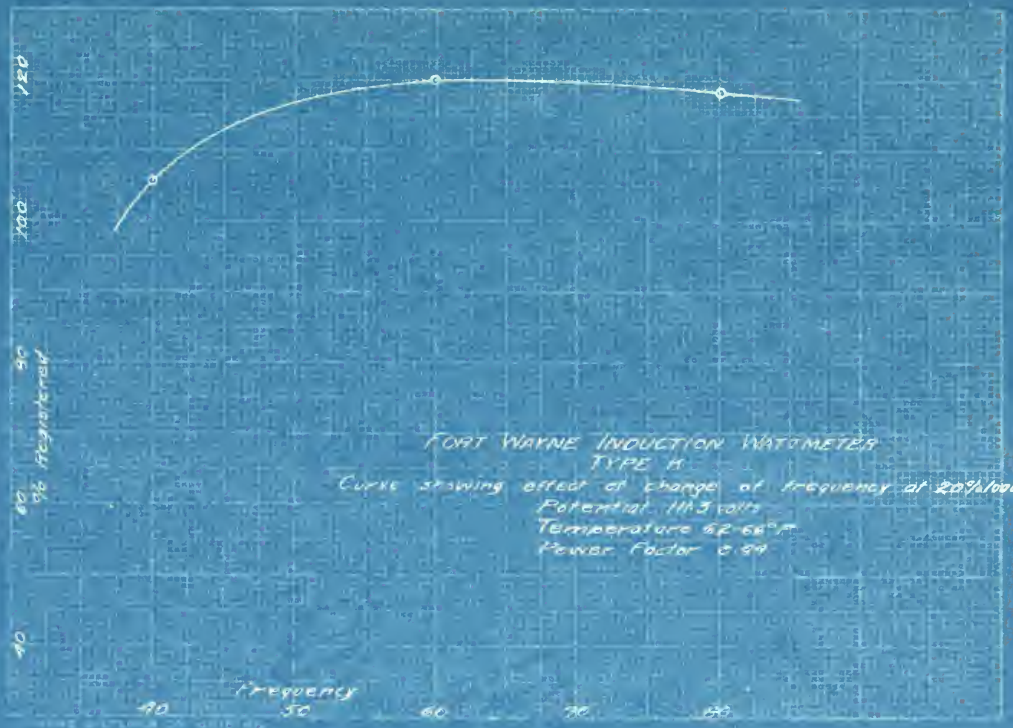
Data showing the effect of change of frequency at 20% load.

Potential = 111.3 volts

Temperature = 62.0 - 66.0°F.

Power factor = .99

Current	Frequency	% Registered
2.0	40	105.8
2.0	60	120.0
2.0	80	118.2



FORT WAYNE INDUCTION WATTMETER
TYPE H
Curve showing effect of change of frequency at 20% load
Potential 111.3 volts
Temperature 62 66°F
Power Factor 0.99

Fort Wayne Induction Wattmeter Type K.

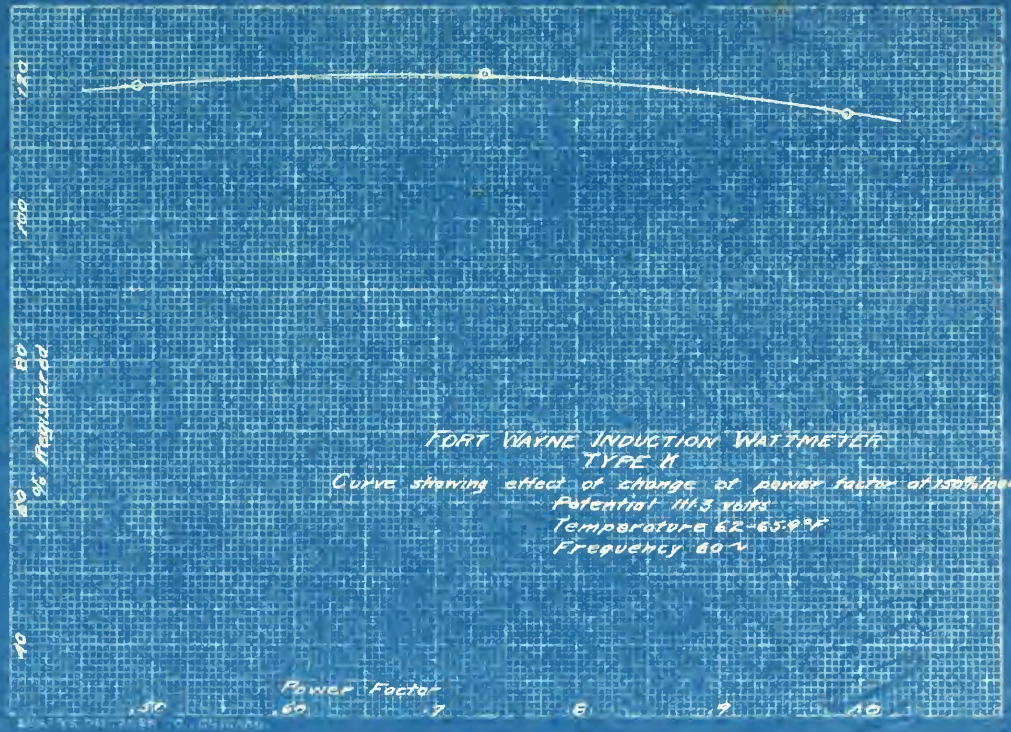
Data showing the effect of change of power factor at 150% load.

Potential = 111.3 volts

Temperature = 62.0 - 65.9°F.

Frequency = 60 cycles/sec.

Current	Power factor	Registered %
15.6	.488	119.0
15.6	.734	120.4
15.6	.99	115.0



FORT WAYNE INDUCTION WATTMETER.
TYPE H
Curve showing effect of change of power factor at full load
Potential 111.3 volts
Temperature 62-65° F
Frequency 60 ~

Fort Wayne Induction Wattmeter Type K.

Data showing the effect of change of power factor at 125% load.

Potential = 111.3 volts

Temperature = 62.0 - 66.0°F.

Frequency = 60 cycles/sec.

Current	Power factor	REgistered %
12.8	.488	120.0
12.8	.734	120.5
12.8	.99	117.0

Fort Wayne Induction Wattmeter Type K.

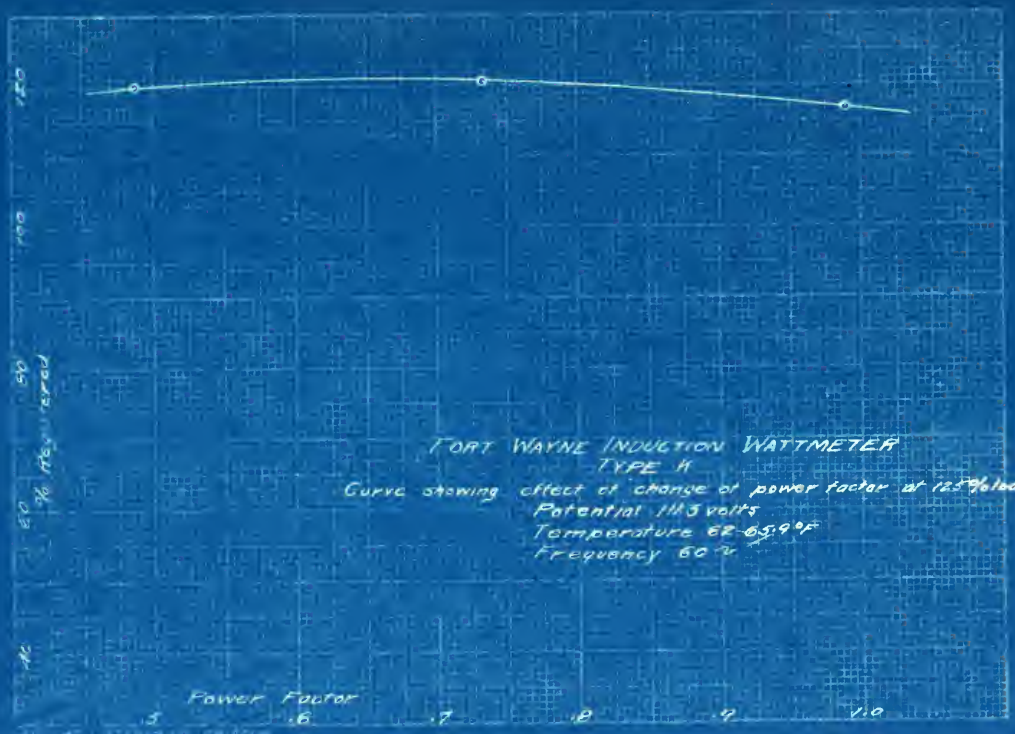
Data showing the effect of change of power factor at 125% load.

Potential = 111.3 volts

Temperature = 87.0 - 88.0°F.

Frequency = 60 cycles/sec.

Current	Power Factor	Registered
12.8	.99	117.0
12.8	.774	120.8
12.8	.58	120.0



FORT WAYNE INDUCTION WATTMETER
TYPE H
Curve showing effect of change of power factor at 12.5% load
Potential 1113 volts
Temperature 62-63.9°F
Frequency 60 ~

Fort Wayne Induction Wattmeter Type K.

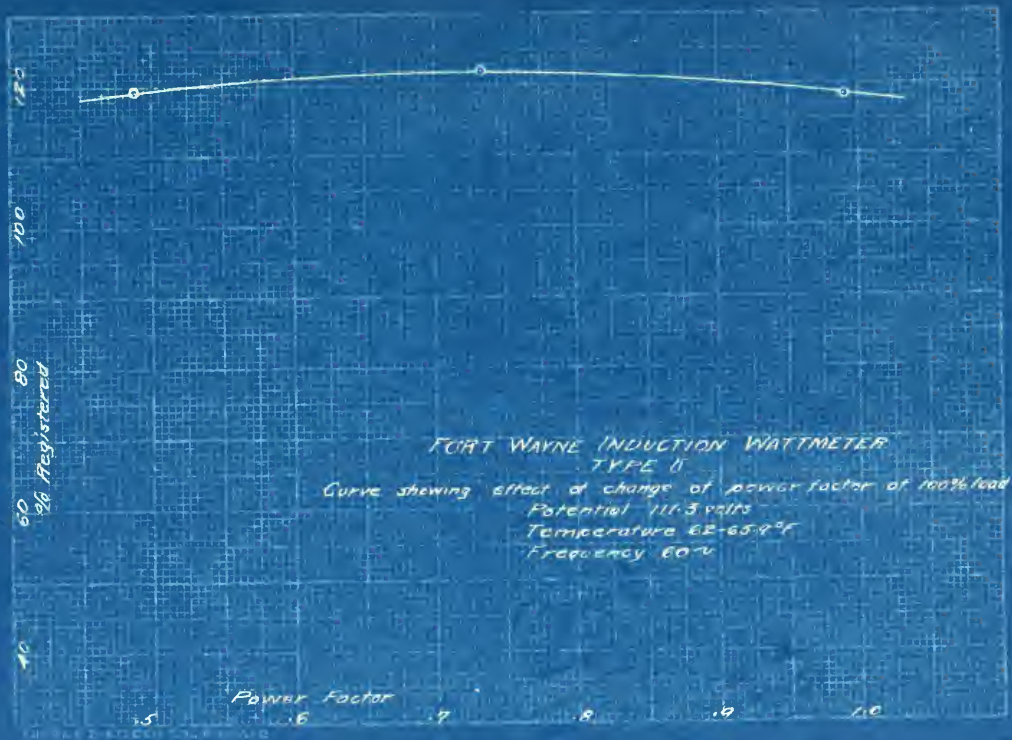
Data showing the effect of change of power factor at 100% load.

Potential = 111.3 volts

Temperature = 62.0 - 66.0°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
10.3	.488	119.2
10.3	.734	122.0
10.3	.99	118.4


120
100
80
60
40
% Registered
FORT WAYNE INDUCTION WATTMETER
TYPE O
Curve shewing effect of change of power factor at 100% load
Potential 111.3 volts
Temperature 62-65.2°F
Frequency 60~
Power Factor
.5
.6
.7
.8
.9
1.0

Fort Wayne Induction Wattmeter Type K.

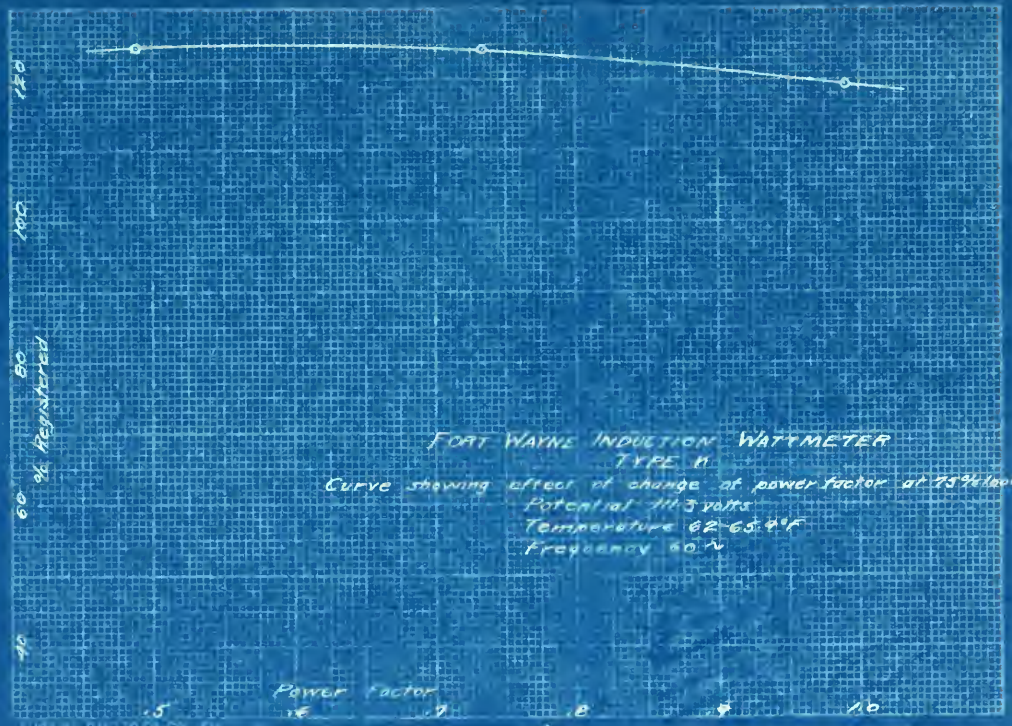
Data showing the effect of change of power factor at 75% load.

Potential = 111.3 volts

Temperature = 62.0 - 66.0°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
7.5	.488	124.5
7.5	.734	124.1
7.5	.99	119.2



FORT WAYNE INDUCTION WATTMETER
TYPE H
Curve showing effect of change of power factor at 75% load
Potential 111.3 volts
Temperature 62-65.4°F
Frequency 60 ~

:Fort Wayne Induction Wattmeter Type K.

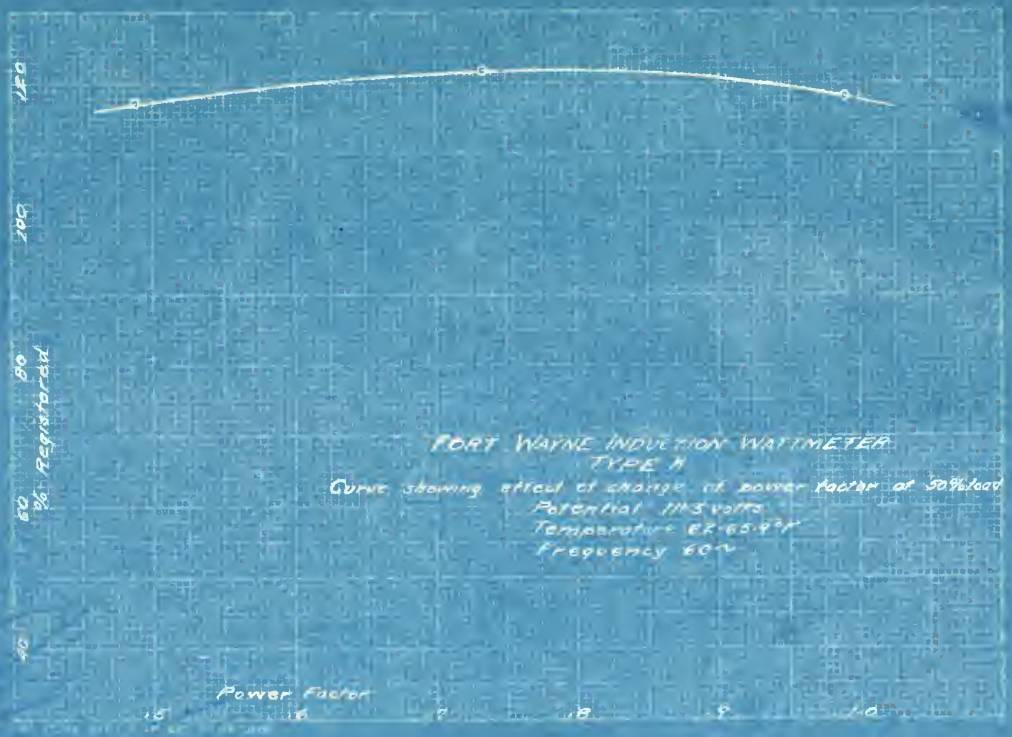
Data showing the effect of change of power factor at 50% load.

Potential = 111.3 volts

Temperature = 62.0 - 66.0°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
5.25	.488	117.1
5.25	.734	121.8
5.25	.99	118.0



FORT WAYNE INDUCTION WATTMETER.
TYPE A
Curve showing effect of change of power factor at 50% load
Potential 113 volts
Temperature 62-65-67°F
Frequency 60~

Fort Wayne Induction Wattmeter Type K.

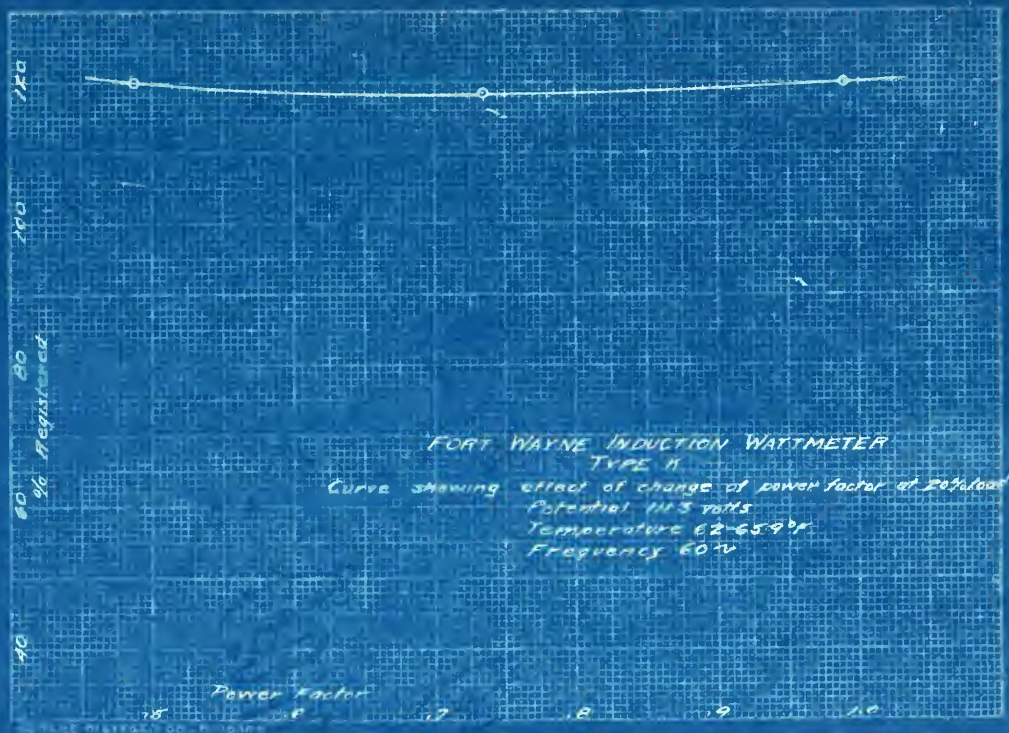
Data showing the effect of change of power factor at 20% load.

Potential = 111.3 volts

Temperature = 62.0 - 66.0°F.

Frequency = 60 cycles/sec.

Current	Power factor	% Registered
2.00	.488	120.0
2.00	.734	118.4
2.00	.99	120.0



FORT WAYNE INDUCTION WATTMETER
TYPE H
Curve showing effect of change of power factor at 25% load
Potential 111.3 volts
Temperature 62-65 °F.
Frequency 60 ~

Fort Wayne Induction Wattmeter Type K.

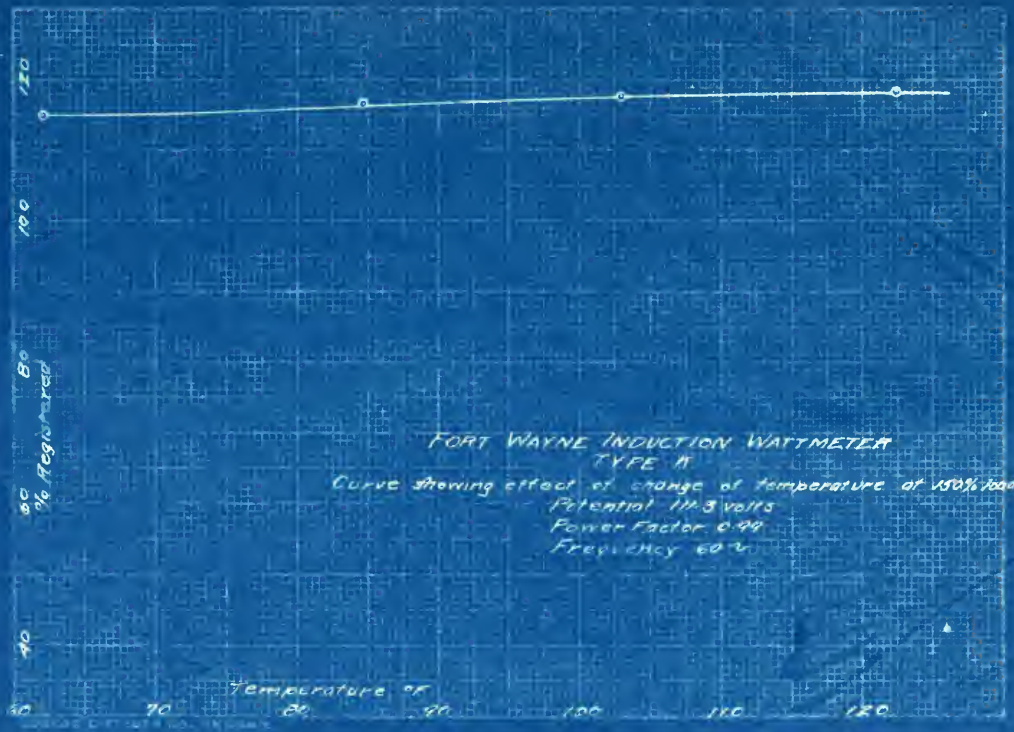
Data showing the effect of change of temperature at 150% load.

Potential = 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
15.6	62.0	115.0
15.6	84.7	116.6
15.6	103.0	117.9
15.6	122.4	118.9



FORT WAYNE INDUCTION WATTMETER
TYPE A
Curve showing effect of change of temperature at 50% load
Potential 114.3 volts
Power Factor 0.99
Frequency 60 ~

Fort Wayne Induction Wattmeter Type K.

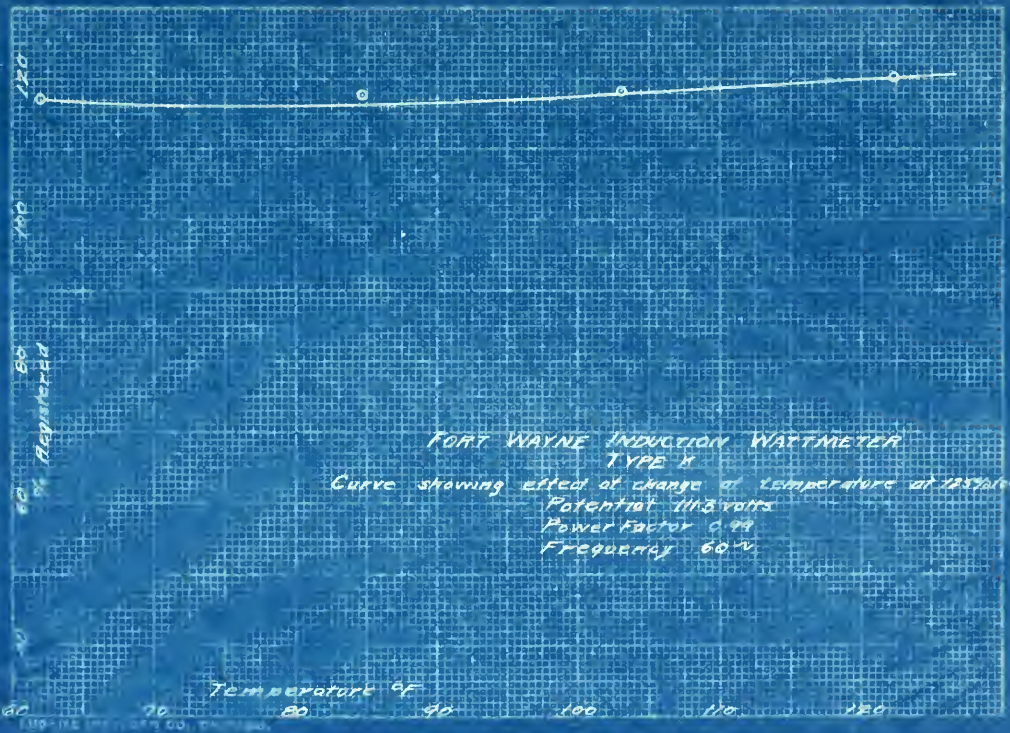
Data showing the effect of change of temperature at 125% load.

Potential = 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
12.8	62.0	117.0
12.8	84.7	117.8
12.8	103.0	118.3
12.8	122.4	120.0


120
100
80
60
Registered
FORT WAYNE INDUCTION WATTMETER
TYPE K
Curve showing effect of change of temperature on registration
Potential 115 volts
Power Factor 0.99
Frequency 60 ~
Temperature °F
60
70
80
90
100
110
120

Fort Wayne Induction Wattmeter Type K.

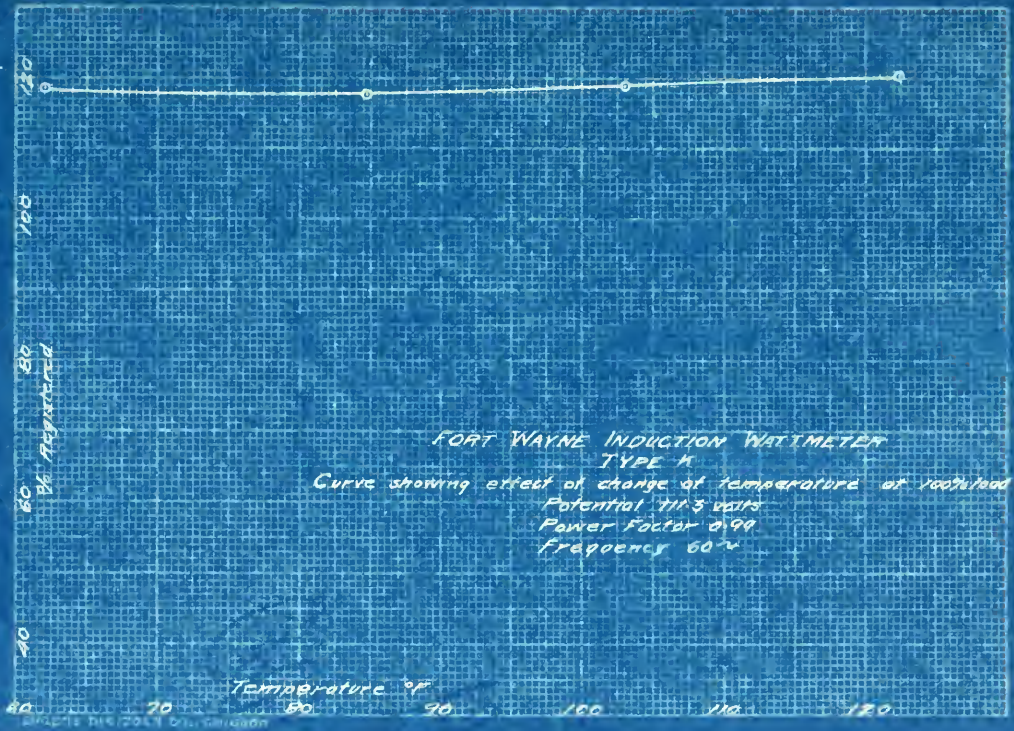
Data showingtthe effect of change of temperature at 100% load.

Potential = 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
10.3	62.0	118.4
10.3	84.7	116.8
10.3	103.0	119.0
10.3	122.4	120.3



FORT WAYNE INDUCTION WATTMETER
TYPE A
Curve showing effect of change of temperature at rated load
Potential 111.3 volts
Power Factor 0.99
Frequency 60 ~

Fort Wayne Induction Wattmeter Type K.

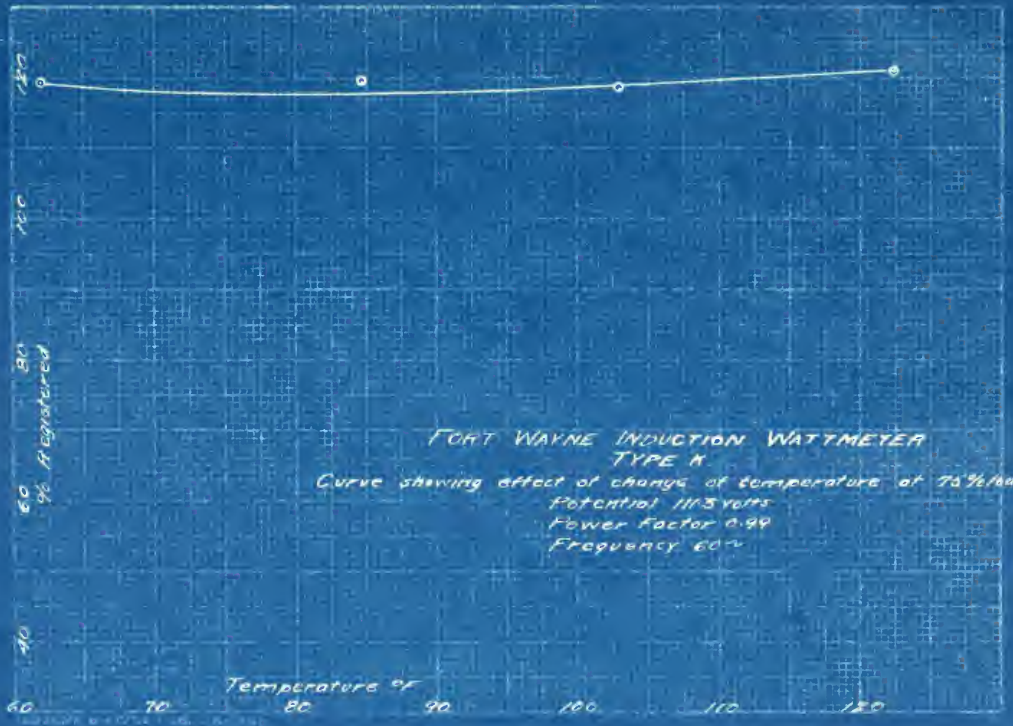
Data showing the effect of change of temperature at 75% load.

Potential = 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
7.5	62.0	119.5
7.5	84.7	119.5
7.5	103.0	118.6
7.5	122.4	121.0


120
110
100
90
80
60
40
% Registered
FORT WAYNE INDUCTION WATTMETER
TYPE K
Curve showing effect of change of temperature at 75% load
Potential 111.3 volts
Power Factor 0.99
Frequency 60~
Temperature °F
60
70
80
90
100
110
120

FortWayne Induction Wattmeter Type K.

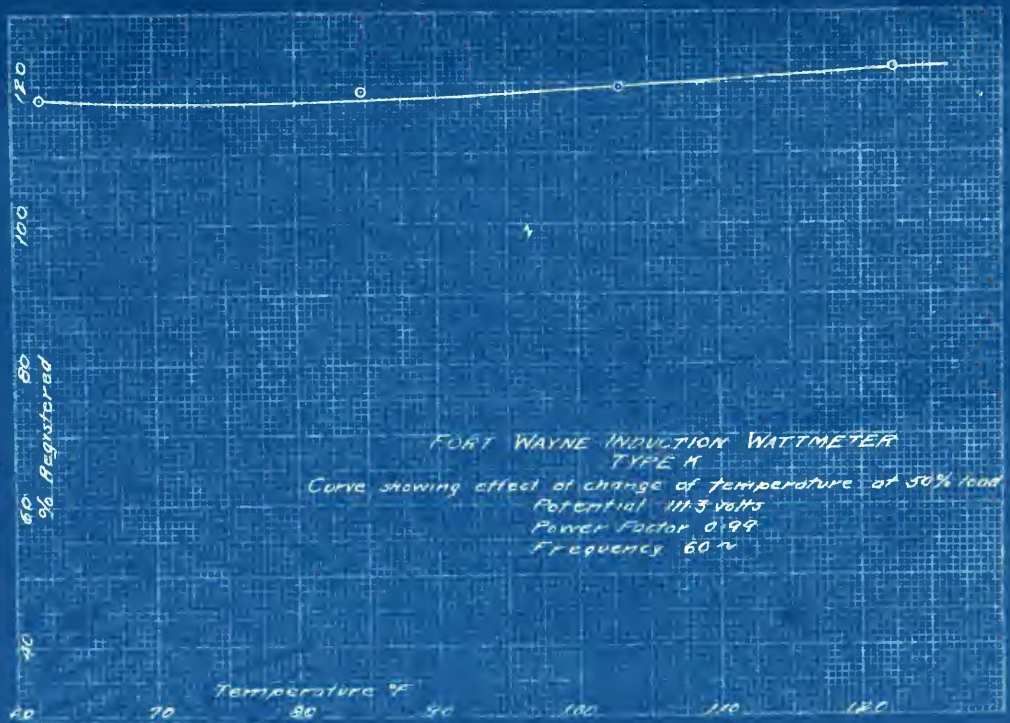
Data showing the effect of change of temperature at 50% load.

Potential = 111.3 volts

Power factor =.99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
5.25	62.0	118.0
5.25	84.7	119.0
5.25	103.0	119.5
5.25	122.4	122.2



FORT WAYNE INDUCTION WATTMETER
TYPE M
Curve showing effect of change of Temperature at 50% load
Potential 111.3 volts
Power Factor 0.99
Frequency 60 ~

Fort Wayne Induction Wattmeter Type K.

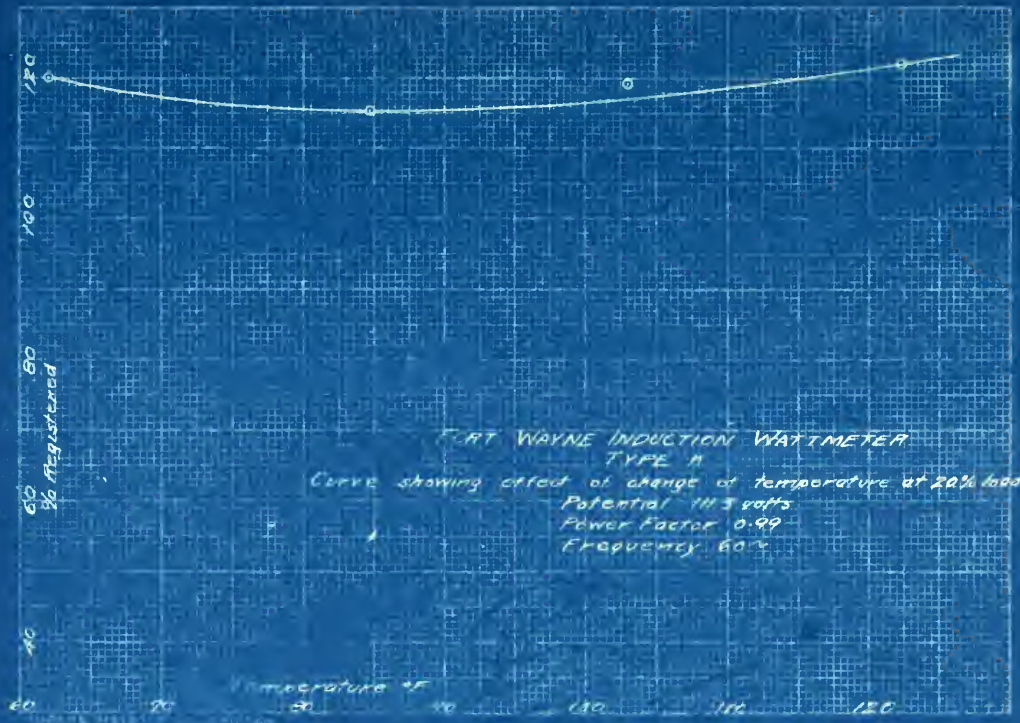
Data showing the effect of change of temperature at 20% load.

Potential = 111.3 volts

Power factor = .99

Frequency = 60 cycles/sec.

Current	Temperature	% Registered
2.0	62.0	120.0
2.0	84.7	115.2
2.0	103.0	119.3
2.0	122.4	122.0



FORT WAYNE INDUCTION WATTMETER
TYPE A
Curve showing effect of change of temperature at 20% load
Potential 111.3 volts
Power Factor 0.99
Frequency 60 ~

Fort Wayne Induction Wattmeter Type K.

Shunt Loss = 2.1 watts at 110 volts and 60 cycles per second.

Series Loss = 6.25 watts at 10 amperes and 60 cycles/second.

Determination of Flux Quadrature

Amperes	Volts	Watts	Cos θ	θ
10.53	107.3	5.0	.00442	89° 44' 48"